THE RHODESIA

Agricultural Journal.

Edited by the Director of Agriculture
(Assisted by the Staff of the Agricultural Department).

PUBLISHED MONTHLY.

Subscription: 5/- per annum; payable to the Accountant, Department of Agriculture, Salisbury.

VOL. XXIX.] JULY, 1932. [No. 7

EDITORIAL.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

The Bacon Industry.—In the March issue of this Journal it was indicated that an enquiry had been made into the bacon industry of the Colony and that a report was being prepared. An abridged copy of the Committee's report is published in this issue.

Certain figures which were supplied by factories for the confidential information of the Committee have been omitted. These indicate, however, that the cost of production of bacon varies considerably with the size of the turnover, and it would appear that economic production cannot be attained unless a sufficiently large number of pigs are handled during the year. At the present time, therefore, this would indicate that in the interests of the pig industry the manufacture of bacon should be concentrated in a small number of suitably located factories.

The report indicates further that before the bacon industry can be satisfactorily established, even to meet our

own requirements, there must be an improvement in the type of pig supplied to the factories, and that to enable an export trade to be profitably established, either in the form of pork or bacon, the costs of production must be considerably reduced.

It has been suggested that all farmers interested in this branch of the industry should organise themselves into a Pig Breeders' Association on the lines suggested in the report. This proposal will be submitted to the Agricultural Unions for their consideration; and if approved, it is suggested that an appropriate time to arrange the preliminary meetings would be at the time of the next Salisbury and Bulawayo Shows.

If this could be done and a small executive committee appointed, the Department would be glad to assist such a committee in every possible way.

Charcoal from Rhodesian Woods.—Probably owing to the interest which is now being taken in farm power from gas producers, numerous enquiries have been received recently in regard to the preparation of charcoal from local woods.

An article has been prepared for this issue by Mr. R. J. Allen, the Forester to the Rhodes Matopo Estate, which will, we feel sure, be welcomed by farmers generally.

It should be noted, however, that experiments so far conducted with our local woods indicate that it is desirable to remove the bark from the wood before burning, otherwise the ash content of the resulting charcoal is likely to be unduly high.

Analyses are now being carried out on a number of the native timbers of this Colony with a view to determining their relative charcoal and ash contents. As soon as these are completed the results will be published in this Journal.

Sudan Grass for Seed.—The Division of Plant Industry of this Department wish to bring this subject to the notice of farmers, particularly those of the southern part of the

Sudan grass, having proved itself such an excellent host to induce the germination of witch weed, and the efficacy of trap-cropping as a means of control having now been so well proved, it follows that for the next few years there is likely to be a considerable demand for seed of this crop.

But cost of seed is an important consideration, and the more cheaply it can be produced or offered for sale the greater the inducement to make use of it. Sudan grass seed has recently been offered in the Union at 3½d. per lb., but when exchange and railage is added, the selling price in Rhodesia will probably amount to between 5d. and 6d. per lb. Twelve to 16 lbs. of seed is recommended to be sown broadcast per acre for trap-cropping purposes, and two trap crops should be sown and ploughed under in the season. Considering the great effect such treatment exerts, both in suppressing witch weed and in restoring fertility, the expense even at this price for seed is not excessive, but it will be all to the good if cheaper supplies of seed can be made available.

As a hay crop Sudan grass has not gained any great measure of popularity in Rhodesia—firstly owing to the plentiful sources of veld grass for conversion into hay, and secondly owing to its susceptibility to a leaf disease, downy mildew (*Sporospora graminicola*), which during continuous wet weather causes great injury to the foliage, and thereby reduces the vitality of the plant.

Past experience, however, has shown that reasonably good returns of seed can be produced in Rhodesia, and yields of 300 to 400 lbs. per acre have not infrequently been obtained. At a selling price of 3d. to 4d. per lb., apart from the question of growing for one's own use, the crop offers moderately good prospects as a side-line.

Better results are recorded with Sudan grass from the Bulawayo Demonstration Station than from the Salisbury Station, the dryer conditions of Matabeleland offering less inducement to the spread of the leaf disease previously referred to. It would therefore appear that the production of Sudan grass seed might well receive the special attention of farmers in Matabeleland, the Midlands and in the Fort Victoria area.

Seed can also be produced in Mashonaland, but in this case it is advisable to postpone sowing until about the middle of January. If leaf disease becomes serious during the early stages of growth, a mowing machine should be run over the crop, and a second vigorous growth more free of the disease can then usually be expected.

The crop requires about four months to mature, and date of seeding should be regulated so that the greater part of the crop's growth may be made after the heavier rains are over. The plant is extremely drought-resistant, and will usually continue vigorous growth for several weeks after rains entirely cease.

Sudan grass is sensitive to frost, and cannot therefore normally be grown in winter; however, as a seed crop, it is deserving of trial under irrigation in frost-free areas. In this case it should be sown not later than the middle of July.

Ten pounds of seed per acre is sufficient when a seed crop is the objective, and the seed should be sown fairly thinly in continuous drills about 18 to 20 inches apart, using a maize planter fitted with kaffir corn plates and splitting the rows. A moderately but not excessively fertile soil should be chosen for the seed crop.

Chilled Meat.—The recent consignments of chilled beef from the Union may mark an epoch in the beef trade of South Africa.

These successful shipments of chilled meat were sent from Johannesburg and from Capetown, and, though the reports indicate that the butchering could be improved upon and that the animals were on the old side, the trade was apparently well satisfied with the consignments.

The net returns of the producers are not available yet. The meat, however, sold comparatively well. An average price of about 4d. per lb. was realised, which indicates that there is a fair market even to-day in the United Kingdom for our best class of cattle as chilled beef.

The development is of great interest to Rhodesian farmers, as nine Lightfoot-Stone refrigerator trucks, which are

capable of conveying chilled beef to Capetown, will be available by the end of the year. As soon as veterinary restrictions on the transit of meat are removed, these trucks will, therefore, provide a means of export for similar consignments of meat from Rhodesia.

An article on the general export situation appears elsewhere in this issue.

Field Control of Angular Spot of Tobacco.—It has been found on the Tobacco Research Station, Salisbury, that applications of Bordeaux mixture to young field plants affected by angular spot gives good control of the disease, provided that all leaves, both visibly infected and apparently healthy, are primed off leaving only the bud before spraying takes place. This method of control was recorded in the departmental handbook "Diseases of Tobacco in Southern Rhodesia," but confirmation on a field scale had not been obtained.

It is, therefore, of considerable interest to find that successful prevention of an epidemic of angular spot has been accomplished by Mr. Hansen, of Dedsi Farm, Sinoia, using only locally obtained Bordeaux mixture and spraying outfit.

Mr. Hansen has kindly reported fully on the results obtained by him, and has given permission for the following extract from his letter to be published in this Journal:—

> It is with great pleasure I forward a report on the control measures I employed in combating this disease with very satisfactory results.
>
> On receipt of your promptly dispatched wire of 14th January, I at once proceeded to prime the tobacco, which at that time had been planted out twenty-six days. In priming everything was removed, leaving just the bud; all leaves were, of course, taken right away from the land and destroyed. Directly following the priming a gang of four natives followed with an ordinary spray pump, arranged as follows: Two natives carrying a five-gallon dip drum on a pole slung from the shoulder by "tambo," one of these stirring the Bordeaux mixture continually, one native pumping and one native directing

the spray on to each plant. A good pressure was kept up, enabling the natives to walk as fast as possible. In this way the spraying gang covered seven acres, or nineteen miles, per day.

The ordinary commercial Bordeaux mixture was used. To facilitate the mixing, all the powder was made up in ten-ounce packets, one of these to five gallons of water giving the correct strength.

As to quantities, two pounds of powder were needed to spray one acre.

Cost per Acre.

2 lbs. Bordeaux mixture at 11d.	1	10
4 natives at 1s. per day	0	7
Total	2	5

The cost of priming and removing leaves not reckoned, as this is ordinary field practice.

Results.—Plants grew out to normal size, with fourteen to eighteen useful leaves, no sign of angular spot at all, and plants free of any blemish till 8th March, when frog-eye made its appearance, owing to the very wet weather experienced at that time.

It was noticed that plants suffering from visible mosaic infection at time of maturity were less than one-half per cent.

In conclusion, I should like to express by sincerest appreciation of the promptitude with which the diagnosis of the leaves was made, enabling me to start the preventive measures during a fortunate spell of dry weather.

DATES OF AGRICULTURAL SHOWS, 1932.

Plumtree	18th June
Umtali	22nd & 23rd July
Bindura	30th July
Salisbury	24th & 25th August
Bulawayo	1st & 2nd September

THE CATTLE INDUSTRY.

By Dr. A. E. Romyn, Senior Animal Husbandry Officer.

The future of the cattle industry in Southern Rhodesia lies in a stern and vigorous policy of improvement in quality.

There are close on two and a half million head of cattle in the Colony, but, with the possible exception of a quarter of a million head, they are all of a type which, under ordinary circumstances, could only be absorbed profitably on the local market. At present, however, this local market is in a position to absorb approximately half of the annual output of cattle—the rest is surplus.

Great Britain is the only international market of importance in the beef trade to-day. For various reasons the smaller markets in Europe and the East do not appear to hold out much prospect for this Colony at present, but, as England absorbs approximately four-fifths of the chilled beef moving into international trade, and half of the frozen beef, there should be room there for any quantity of beef Southern Rhodesia could produce. It must, however, be realised that this market will not interest itself seriously in our products until we can guarantee both the quality and the regularity of our supplies—and the trade must he organised on lines which will ensure these requirements.

The Scrub.—At present the so-called "scrub beast" is the predominant type produced in this country. Generally speaking, this type of beast can be exported only as frozen beef. Unfortunately, however, the demand for frozen beef in the world is contracting, and the prices for it usually do not allow the producer a margin of profit when normal capital expenses are taken into account. There is no reason to expect a very vast improvement in this respect in the future.

The producer of the scrub animal who hopes to make a living from cattle farming has, therefore, two courses open to

him. He can either limit his production to the demands of the local market or he can improve his cattle so as to take advantage of the chilled beef and live cattle export trades, which yield much better returns than the frozen meat market.

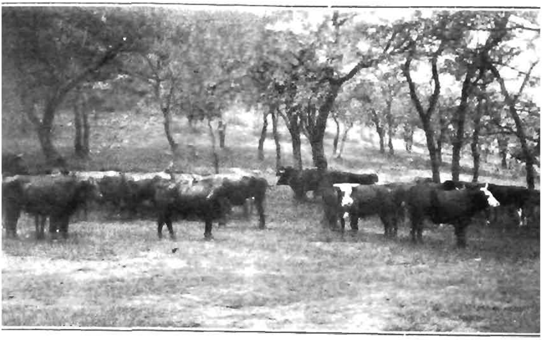
The course of limiting production to the local market is not likely to be a success. A certain steady demand for many years to come for compound and native meat seems assured, but the market is already over-supplied, and it is likely that it will always be dominated by the native beast and cull dairy stock.

Improvement in quality, therefore, is essential, and though prices may not be profitable in the transition stage, when the cattle are too good for the local market but not sufficiently good for the chilled meat or live cattle trades, there should be a fair market for the intermediate grade of cattle as frozen beef of an average quality in the United Kingdom for some time to come. There is also a good deal of comfort in the old saying, "half the breeding of a beast goes in at its mouth," and, if the improvement in breeding is accompanied by a determined effort to improve the feeding of the beast, the transition stage will be much shorter than is commonly anticipated.

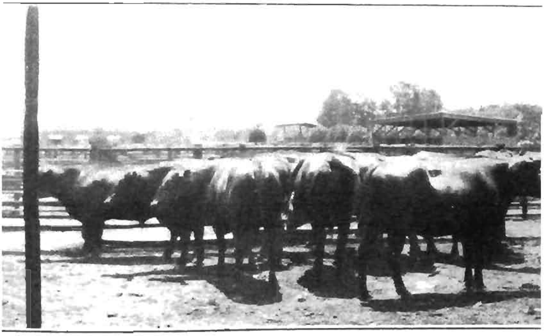
The Improved Steer.—The prospects for the better grades of cattle are more promising. The present outbreak of foot and mouth disease has clouded the issue, but there are no fundamental reasons for doubting the future of the Colony for the production of cattle. Land is cheap and the country is suited for the production of beef. An upward trend in beef prices in relation to dairy products is expected when conditions return to normal, and there are hopes of an Imperial preference or quota.

Facilities for export exist, and once veterinary restrictions are removed, there is little doubt that a demand for Rhodesian beef could be created in England *if farmers could guarantee a regular supply of the quality of cattle required.*

Chilled Beef.—The aim of producers is to develop an export trade in chilled beef. The recent exports of chilled beef from the Union may therefore mark an epoch in the meat trade of South Africa. The preliminary reports on these consignments are encouraging and indicate that, with the co-



Well-finished grade Hereford bullocks. Some too old. Age 4-6 years. Live weight 1,253 lbs.



Good average Angus bullocks. Smooth, nice quality, but not quite finished. Age 3-4 years. Live weight 1,177 lbs.

operation of our neighbours in the South, viz., Bechuanaland, South-West Africa and the Union, it should be possible even now to launch a limited trade in chilled beef.

There are comparatively few steers in South Africa to-day of the quality required to meet Argentine competition, and the question has been raised as to whether the Colony can ever produce any quantity of the grade of chilled beef exported from the Argentine. The answer seems to be in the negative, but there is not much doubt that a grade of beef could be produced in comparatively large quantities which would be acceptable on the Home market and would leave the producer a fair return for his efforts.

In almost all cases some supplementary feeding would be necessary, but, with a fairly secure prospect of obtaining a net return of not less than 25s. per 100 lbs. dead weight, which is not an unreasonable anticipation, breeders should be able to turn out a considerable number of good to very good medium steers comparable, perhaps, with the average run now exported from Uruguay, and acceptable on the English market.

Legislation.—There is so much of a tendency to "wait and see" what the market will do and to hang back for an assured profitable outlet before doing anything, that it may be doubted whether the present generation of farmers will get down to the task of cattle improvement and persevere through the intermediate stages without some legislative compulsion. The fact seems generally to be overlooked that there are ample lands elsewhere in the world which are now producing beef for the English market, and that this Colony will always have to meet keen competition, as any improvement in the price of beef would stimulate production in these countries as well as here. The psychological time to get into the market would therefore appear to be *now*, when breeding stock is cheap and when other countries are decreasing their beef herds or changing over to dairying—to which latter industry a considerable part of this country is not well suited.

Two measures seem essential to hasten the rate of progress. These are:—

(a) The inspection and licensing of bulls, with the compulsory castration of undesirable sires.

(b) The payment for cattle on a basis of live weight.

Legislation in respect of the licensing of bulls has been introduced in Ireland, and in respect of weighing of cattle in the Argentine. Both countries are predominantly dependent on the English market, and in both countries authorities attribute the improvement which has taken place in the quality of the cattle and beef exported to a large extent to these measures. Cattle owners in the Union are pressing for similar regulations at the moment.

The use of well-bred bulls is only the first step towards the improvement of a herd. Conditions must be improved to enable these bulls to do themselves justice. A good bull under scrub conditions may do more harm than good to the herd, and under supervision made possible by a system of licensing bulls and the availability of weight and price records not the least benefit would be the possibility of bringing into operation a definite breeding and management policy for the various areas in the Colony.

A lead could also be given in many economic problems. For instance, the fattening of steers for export as chilled beef or as live cattle could be properly organised. At present there is no regular contact between the ranchers in the south, who can produce steers cheaply, and the agricultural farmers in the north, who need the steers to convert part of their maize crop into beef. Systematic arrangements should be made, either to bring the cattle to the feed or the feed to tbe cattle, whichever in the circumstance proves the most economical of effort and transport.

There are also some areas where, on account of the difficulty of providing winter feed and the low value of the grazing during the dry months, it may not be advisable to keep steers longer than the weaner stage. Ranchers in these areas should be indnced to dispose of calves to feeders in parts more favourably situated for the production of supplementary feed, or, possibly, to export these calves direct as frozen "veal" to England, if the trial shipment to be made shortly is as successful as its organisers hope.

The Export of Cattle on the Hoof.—The export of chilled beef has been indicated as the objective of the cattle farmer. It should, however, be pointed out that at the beginning the cheapest way to export cattle may be on the hoof on account

of the relatively heavy expenses in the chilling and transport of meat when a small number of cattle only is handled. It is likely, therefore, that the export of cattle on the hoof, which was cut short by an outbreak of foot and mouth disease in April, 1931, will be resumed when veterinary restrictions are removed.

The fortune of this trade since it was started by Mr. J. R. Stewart in 1925, has been a fluctuating one. Since that year there have been 10 shipments totalling 2,500 head of cattle. It has been necessary to assist the trade by a bounty, as the returns from these cattle have, on the whole, been smaller than the values they would have realised on the Johannesburg market at the time they were exported. It seems too optimistic, however, to anticipate a return to the prices which ruled at Johannesburg for this type of Rhodesian cattle two years ago, and farmers will perforce have to pay more attention to this trade in the future. The magnitude of the trade can be gathered from the fact that in 1931 Great Britain imported 739,000 head of cattle on the hoof from the Irish Free State, valued at £12,900,000, and 27,000, valued at £554,000, from Canada.

It has still to be determined whether it will be more profitable to export two- or three-year-old steers which have been intensively fed, or older cattle which have been grown out more cheaply and then fattened. The determining factor will be the cost of transport and marketing in proportion to the price paid per lb. for different weights of the steers. It should not, however, take the industry long to learn which is the more profitable type to export.

The two illustrations show the type of bullock shipped in the last consignment per the S.S. Clan Morrison, and should be of interest in this connection.

The two lots shown sold at above the average price for the consignment, but were faulted at Smithfield as being too aged and on the heavy side.

The disadvantage of shipping a light bullock lies in the fact that it pays the same transport and marketing charges as a heavier animal, and, in the past, has not sold at sufficiently more per lb. to compensate for the relatively heavier cost in getting it to market.

In the Clan Morrison consignment the best prices per 100 lbs. live weight were made by bullocks weighing about 1,100 lbs., but the best financial returns were given by bullocks weighing over 1,400 lbs. The criticism in regard to weight and age should be borne in mind, but it is likely that until freight rates are reduced, the tendency will be to continue to ship comparatively heavy cattle.

Summary.—To summarise these views, one might say that, given the necessary ambition, there is every reason to believe that the raising of beef in Rhodesia could be made a considerable and profitable industry.

The key to the position is improvement in quality. Those producers who improve their herds can look to a fair market in the United Kingdom. The producer of scrub cattle has, however, little to look forward to. He acts as a dead weight on the local market and retards the expansion in the number of better cattle, which is necessary to maintain a trade with the English market. For his own good, therefore, and for that of his country, he should be forced, by legislative means if necessary, to improve his cattle.

Perhaps the newly-formed Cattle Owners' Association will take the lead in creating the atmosphere necessary to get things moving. The present depression is as much psychological as economic.

TWENTY-ONE YEARS OF PLANT INTRODUCTION AND TRIAL IN SOUTHERN RHODESIA.

By H. G. Mundy, Dip.Agric.(Wye.), F.L.S.,
Chief, Division of Plant Industry.

To the founder of the Colony, Cecil John Rhodes, is due the credit for the first deliberate introductions of plant material with the object of ascertaining the agricultural possibilities of Southern Rhodesia. Mr. Rhodes' interest in agricultural development was intense, and as is evidenced by his will, one of the main reasons for developing his extensive estates at Matopos and Inyanga was to ascertain the farm crops, fruits and forest trees best adapted to local conditions.

In December, 1896, lucerne seed was sent by him from Port Elizabeth for trial under irrigation at Matopos, and the following year he imported from Australia a number of varieties of orange trees and also saltbush for experimental propagation on the same estate. Simultaneously Mr. Rhodes introduced to the Inyanga Estate a wide selection of apple, peach, plum and apricot varieties. In 1900 he gave thought to afforestation, and in that year a commencement was made in laying down plantations of cypress, pine, eucalyptus and wattle at Inyanga, while initial trials were also made with paspalum grass and sheep's burnet.

These experiments were conducted under the supervision of Mr. J. G. McDonald (now Sir James McDonald), who between the years 1909 and 1913 published valuable information on the results obtained therefrom in his several editions of "Hints to South African Farmers." The same gentleman has kindly given the writer the following brief but interesting record of Mr. Rhodes' discovery of the valuable pasture and hay grass which since then has universally borne his name:—

> "It was in 1896 that Mr. Rhodes noticed a grass growing in the greenstone-schist kopjes (not granite) on the Sauerdale and Westacre Estates (near Bulawayo) which he observed that stock were particularly fond of. He arranged that roots of this grass, and later seed when available, should be sent to him at Capetown. This was done; the grass was further propagated at his residence Groot Schuur, in the Cape, and from this began the world-wide distribution of Rhodes Grass."

Seed and plant introduction and distribution was maintained on a limited scale by the Department of Agriculture during its early existence under the administration of the British South Africa Company, but as far as can be judged from the records available new introductions, apart from maize varieties and forest trees, were only made from Southern Africa.

In 1909 the Department was re-organised, and with the appointment of the writer in the capacity of Agriculturist and Economic Botanist, and with the opening of the Botanical (now the Agricultural) Experiment Station, Salisbury, providing suitable trial grounds, the work of plant introduction became one of the primary functions of that station. During the first two years, 1909-1911, the station concentrated on variety trials with those crops already known or reported to grow well or moderately well in the territory, and not until this preliminary survey had been undertaken were more diversified field experiments, accompanied by a wider range of plant introductions, commenced.

It is hardly less important to know the crops and varieties which can be grown in a country with success than it is to know those which cannot be so grown. Knowledge on both points is essential if the individual farmer is to be saved much unnecessary expense and wasted effort. Plant introduction has therefore been continued systematically since the above date, and during the intervening period many thousands of introductions have been made, some aiming at procuring strains of wheat and oats sufficiently rust-evading to be grown as summer crops, some in order (if possible) to secure pasture plants capable of growth and remaining green during the dry winter, others to introduce varieties more resistant to disease or insect pest or capable of affording higher yields

per acre, and yet others to enlarge the range of marketable crops or foodstuffs for home use which the Colony may produce.

With few exceptions, the standard strains of seed grown in Rhodesia to-day are the result of these introductions and eliminations made on the Salisbury station during the past twenty-one years. Examples are the white stingless and osceola velvet beans, brown dolichos bean, Sunn hemp, oat selections adapted to growing in summer, Sudan grass, the winter wheat varieties now in favour, sunflower, certain varieties of lucerne and clover, bush and other improved types of cowpea, sweet potatoes, edible canna, soya beans, dhal, Napier grass, kudzu vine and sundry other crops, as also to a lesser degree the varieties of maize and potatoes now grown. But while many introductions—several further improved by subsequent selection—have been attended by marked success, far more not unnaturally have given more or less negative results, and it is with the latter that the present record will principally deal.

The methods followed have been to grow each introduction for at least two years on small plots of one-fiftieth of an acre or less in area. When results have justified such a course, cultivation has then been extended to larger plots for a further period of years, and on these plots, and sometimes on other Government farms, acclimatised seed has been bulked up for issue to farmers under terms of co-operative experiments. Planting material has thus been disseminated through the Colony, and in a comparatively short period the apparently more promising introductions, varieties or selections have either established themselves as common crops of the country or have been discarded.

Apart from actual introductions from other countries, a large number of native (indigenous) grasses and other plants have also been grown under cultivation in order to study their suitability as pasture or browse plants, as sources of fibre, as legumes for fodder and green manuring, or in a few instances as plants of apparent pharmaceutical interest.

According to their characteristics and probable needs and possibilities, plants have been tested as dry-land crops under summer rainfall conditions, as irrigated winter crops,

or as crops grown under the summer rainfall and maintained by irrigation during the winter. Unless the individual has shown definite signs of promise, its trial has often been confined under the above conditions to the red clay loams of the Salisbury station, but not infrequently crops of considerable economic importance have been further tried out on other soils and at other altitudes.

In a number of cases results are of an indefinite nature, due to growth or yield being only partially satisfactory, or to there being no apparent economic outlet for the product. In the former of these instances it is possible, though not considered probable except where stated, that some of the plants may eventually prove themselves better adapted to the conditions of soil, altitude and rainfall pertaining to other parts of the Colony.

This record omits for the most part any reference to the behaviour of the many pasture grasses and clovers, and all reference to the various strains of wheat, oats, barley, rye and tobacco, which have been experimented with. It deals therefore with only a small fraction of the actual introductions which have been made.

In the case of the grasses and clovers, information has been obtained regarding the conditions which they are unable to tolerate, and they are now in process of being exhaustively tested under what are regarded as the optimum conditions which the Colony can afford. The more promising survivals of the wheats are receiving the attention of the Government Plant Breeder with a view to further improvement in respect to rust resistance, yield and quality. The testing out and pure line segregation of tobacco varieties and strains is in progress on the Tobacco Research Station, and similar work on oats and soya beans—which has already eliminated a number of the less desirable features in the more suitable strains of these crops—is being continued on the Agricultural Experiment Station, Salisbury. As far as barley and rye are concerned, no introductions have yet proved better suited to local conditions than Cape six-row barley and Cape ear rye.

LEGUMINOUS PLANTS.

ALYSICARPUS (*Alysicarpus sp.*).—A semi-prostrate native legume prevalent on black vlei soils, which, under su

conditions, may prove of value as a herbage plant. Apparently not very palatable to live stock, and is not recommended for dry soils. *A. rugosus*: A common leguminous weed of India, more upright in habit of growth, has been introduced, but has so far shown no great promise. The same species is native to Rhodesia but is of more prostrate character than the Indian type.

AMBERIQUE BEAN (*Phaseolus helvolus*).—Grows well as a summer crop on fertile, well-drained land. It yields a reasonably heavy crop of hay of fine quality, which is easily cured. Requires a long growing season and is very sensitive to frost; often behaves as a biennial and seeds well in its second season. Very liable to attack by leaf-eating beetle and by stem maggot and stem weevil, and, on the whole, is not as hardy or as heavy a yielder as dolichos and velvet beans or cowpeas.

ASTRALACUS (*Astralagus sinensis*).—Climatic conditions appear unsuitable to this crop, which has invariably failed to develop any vigour of growth.

BAMBARRA CROUND-BEAN (Syn.: Earth nut. Nat.: N'Yemo.) (*Voandzeia subterranea*).—A pulse crop of the African native; good drought resister but a small yielder, and does not appear worthy of European cultivation.

FLORIDA BECCAR WEED (*Desmodium tortuosum*).—This useful legume grows readily from seed and seeds profusely. At one time great expectations were had of the plant, but after repeated trial it has proved unable to maintain itself on any land on which established, though volunteering with much frequency for a year or two on adjoining ploughed land and sometimes in the natural veld. Other varieties of this plant of the giant type which have been tried are: *D. rensoni*, *D. leiocarpa* and *D. rhytidophyllum*. These species are too tall-growing and coarse for hay or green manuring, and appear unable to tolerate repeated cutting for green forage. They may possess value as shade bushes and "lopping" legumes for coffee plantations and tea gardens.

BERSEEM (Syn.: Egyptian clover) (*Trifolium Alexandrinum*).—This annual legume has proved of no value in Rhodesia as a rainy season crop, but may eventually find a

place under irrigation in the warmer areas as an annual, winter hay or green soiling crop. It has occasionally given fairly heavy yields (up to three cuttings) of fodder under suitable conditions.

CALOPOGONIUM (*Calopogonium muconoides*).—Introductions have failed to grow satisfactorily. Requires a very long growing season and has been killed by frost before much growth has been made or seed set.

CAROB BEAN (Syn.: Locust bean) (*Ceratonia siliqua*). —Only grows moderately well at the higher elevations and fruits but sparingly. Is said to do better at the lower altitude of Umtali, where yields of 900 lbs. of beans per tree of 9 years old and over have been reported. Extended cultivation does not in general appear warranted.

CENTROSEMA (*Centrosema pubescens*).—A green manure and cover crop of Ceylon. Conditions in Rhodesia are insufficiently tropical to suit this plant's requirements, and it does not mature seed here.

CLITORIA (*Clitoria cajanifolia*).—An upright, bush-like plant employed in Ceylon for green manuring and cover cropping. Grows well, but its woody growth and branched habit renders it unsuitable for general green manuring purposes in Rhodesia. May find a place in coffee and tea gardens.

CROTALARIA (*Crotalaria spp.*).—Many species of Crotalaria have been tested, including the indigenous *C. montana*, *C. maxillaris* var. *intermedia* and *C. lanceolata*, *C. sphæricarpa*, *C. natalita* and *C. stewartii*. None of these equal the true Sunn hemp in vigour or value as green manure crops. *C. anagyroides*, *C. striata* and *C. usaramoenis* have been introduced for trial. The first and second of these grow very slowly in the early part of the season, but eventually form vigorous bushy plants which, however, do not commence to flower until late summer or early winter. They are too slow growing and too branched to be suitable for green manuring in this Colony. *C. usaramoensis* is claimed to be resistant to nematode. It requires a longer growing season than *C. juncea* and possesses the disadvantage of dropping its earliest matured seed pods before the later produced pods are ripe.

DAINCHA (*Sesbania aculeata*), also the indigenous species *S. microphylla*, *S. tetraptera*, *S. cinarescens* and *S. cærulescens.* Apart from colour of flower, Daincha and the two native species are similar in habit of growth and thrive best on wet valley soils, which comprise the sole natural habitat of the native species. Germination and growth are very irregular; the stems are much coarser and more woody than those of Sunn hemp, and none of the species have proved as suitable as the latter for green manuring. Daincha and the two native types if sown thinly produce straight sticks of some value for hanging tobacco on in the curing process.

A type might perhaps be developed which would be of particular merit for the green manuring of wet vlei soils uncongenial to other legumes. The green leaves are browsed in autumn by cattle.

DHAL (*Cajanus cajang*).—Grows freely in all parts of Rhodesia and has some value as a temporary shade or summer hedge plant. Leafless in winter. Cattle do not relish the green foliage. The labour of reaping and threshing the crop is considerable, and the yield of grain is not heavy. Usually survives for two or more seasons. Might be made more use of as an auxiliary pulse crop, while the clusters of green pods and the young branches can be made into a palatable hay or may be ensiled.

FIELD PEA (COMMON) (*Pisum sativum arvense*).—This type of pea only succeeds in the cold months of the year. During the rainy season the plants suffer severely from white mould and mildew. One exception, namely, "Black-Eyed Susan," can be grown as a field crop in summer, but this variety is of poor quality for culinary purposes. Some success has been had with Yorkshire Hero as a garden crop in summer, but, in general, peas must be regarded as a cold weather crop to be grown under irrigation.

FISH POISON BEAN (*Tephrosia spp.*).—The varieties *T. vogellii* and *T. heckanniana* appear natives of Rhodesia. *T. candida, T. toxicaria* and *T. purpurea* have also been tested. The young leaves and flowers of *T. vogellii* are macerated by the natives and thrown into pools in which fish

are known to lie. After the water has been disturbed, the fish soon float to the surface in a stupefied condition.

These plants have some merits as garden ornamentals, but are useless as fodder plants, and owing to their bushy and woody growth, they are unsuitable as green manure crops. May be of use as lopping plants in coffee plantations and tea gardens. The pharmaceutical value, if any, of their chemical properties has not yet been fully investigated.

The Fish Poison Bean (*Tephrosia vogelei*).

GEMSBOK BEAN (*Bauhinia esculenta*).—A trailing legume which produces very large succulent roots. Makes little above-ground growth and does not seed in Rhodesia. Less valuable and more costly to harvest than sweet potatoes, edible canna and similar succulent crops, and not worthy of cultivation in this Colony.

GOAT'S RUE (*Galegia officinalis*).—A leguminous herbage plant. Does not succeed here on dry lands and seldom survives the winter, while making very little growth even during the rains. Under irrigation does not compare in value with lucerne and clovers.

GOTANI BEAN (*Canavalia ensiformis*, D.C.).—Similar to Jack bean; biennial, and sometimes longer lived. Colour of seed, white. Bush-like in growth, attaining a height of 18-24 ins. Although it has outyielded other beans, it cannot be depended upon to give a good return of seed for the first season, and is not as valuable for green manuring as several other legumes. Yields better in seasons of light rainfall than when rains are persistent; moderately tolerant of frost; very susceptible to attack by certain species of small beetles. If a biennial green manure crop of upright habit is required to replace dolichos or velvet beans, this crop may prove useful.

Apparently unpalatable to live stock in its green state and not much favoured when converted into hay or silage. The dry beans are said to be somewhat indigestible, though the green pods may be used as a substitute for French beans, and the immature seeds as a substitute for broad beans.

GRASS PEA (Syn.: Canadian wedge pea, Spanish lentil) (*Lathyrus sativus*).—Varieties *L.s. albus*, *L.s. azurea* and *L.s. coloratus* have been tested. These plants thrive moderately well both in winter and summer, but the yield of fodder is insufficient to warrant their adoption as field crops. Of some value to replace green peas in summer or as a substitute for dry peas for culinary purposes. Has given fair yields in some areas under irrigation as a winter legume for green forage or hay. By analysis, the hay has an exceptionally high feeding value.

GRAM (Syn.: *Chick-pea*) (*Cicer arietinum*).—Many strains have been tested, but the yield as either a summer or winter crop does not compare with that of many other legumes which can be grown. Does not seem likely to attain popularity in Rhodesia, though may possibly be grown in combination with oats as a winter forage crop.

GRAM: BROWN HORSE (*Dolichos biflorus*).—A creeping, fine-foliaged legume which covers the ground with a

thick mass of low-growing vegetation. The yield of fodder, however, is light, and the Rhodesian season is usually too short to allow of the maturing of any but a light crop of seed. Very sensitive to frost and much attacked by leaf-eating beetles. Should prove a valuable fodder crop in territories with a climate somewhat more tropical than Southern Rhodesia.

Indigofera endecaphylla.—The native species possesses some merit as a herbage plant. It attains a height of 6-9 ins. and is grazed by cattle and sheep. Does not seed freely, but growth in natural pastures appears to be stimulated to a marked degree by applications of artificial fertiliser.

Seed of the same species introduced from Ceylon has produced a more upright plant of straggling habit, attaining a height of some 15 ins. It seeds more freely and shows some tendency to root from the nodes of prostrate stems. The fodder has been eaten freely by mules. Appears to possess possibilities as a leguminous herbage plant for upland soils.

FIELD BEAN: COMMON (*Vicia faba*).—This class of bean only thrives as a winter crop in Rhodesia. To obtain a set of seed the top of the flower spikes must be pinched out soon after blossoming commences. If this precaution is adopted, garden types of this bean can be grown successfully as a winter crop under irrigation. Much attacked by aphides. Not a field crop. The tick bean, or horse bean, closely related to the above, will only grow under similar conditions of treatment, and the seed yield at the best is small.

JACK BEAN (*Canavalia sp.*).—Very similar to Gotani bean and producing a white seed, but the plant has a rambling habit of growth. The pods attain a length of 6-9 ins., with a width of ¾-1 in. The seed yield is uncertain, and the plant is too woody to be ideal for green manuring. The dry beans are said to be highly indigestible and occasionally poisonous.

The **SWORD BEAN** (*Canavalia gladiata*) is a pronounced climber producing even larger pods, which contain 6-9 large red seeds. The green beans are said to provide a palatable cooked vegetable with a mushroom-like flavour. Of no importance as a field crop in Rhodesia.

The climbing varieties, known locally as khaki Jack bean (*Canavalia obtusifolia* and *C. ferruginea*) occur wild in the Colony, but differ in no important economic aspect from the other species here referred to.

KUDZU VINE: RHODESIAN (*Glycine javanica*).—Is a fairly widely distributed native legume of the heavier soils of the Colony and is useful as a herbage plant. It does not, however, appear able to withstand heavy stocking, and makes comparatively small growth on pastures which are regularly grazed. *G. tomentosa* and *G. clandestinum* from Queensland have also been tested, but none of the three equal the Japanese Kudzu vine (*Pueraria thunbergiana*) in vigour or economic value in Rhodesia.

LENTIL: FRENCH (*Ervum ervilia*).—Useless as a summer rainfall crop. Thrives fairly well in winter but produces a very light yield of grain and fodder. Not likely to prove of economic importance here.

LIMA BEAN (*Phaseolus lunatus*).—The Rhodesian summer is rather short for the field types of this bean. Occasionally successful as a garden crop but not equal to other kinds of green beans in yield and hardiness. No marked success has been obtained with any lima bean on the Salisbury Station, though the bush lima shows some promise. Certain types may perhaps be developed as field crops if sown under irrigation before the rains commence, and thus given an extended growing season.

SEVEN YEAR BEAN or **PAINTED LADY** (*Phaseolus lunatus*, var., *macrocarpus*).—This is very closely related to the Lima bean, but is a most luxuriant climber; biennial and often long-lived. The seed is a dull brownish-red in colour on the small end and up to the edge of the hilum or "eye," with a few scattered spots of a similar colour on the remainder of the surface, which is white. Grown occasionally as a garden crop. The beans are said to be very palatable when cooked in the green stage, as a substitute for broad beans in summer. Not suitable as a field crop, and the colour of beans renders them unpopular on overseas markets.

LUPINS (*Lupins spp.*).—The varieties white, yellow and blue have been tested, but the crop only thrives to advantage

in late autumn. Early summer sowings usually fail, and later planted crops mature too late for ploughing under before the land becomes dry. May prove of value for autumn feed for sheep at altitudes above 6,000 feet, provided the rainfall at that period of the year is adequate.

MOTH BEAN (*Phaseolus aconitifolius*).—A procumbent type of bean for which the climate does not appear suitable. Does not attain a height of more than 6 ins., and would seem to be without economic importance to Rhodesia.

MUNG BEAN (Syn.: Green gram) (*Phaseolus mungo*).—Also Yellow Mung bean, *P. aureus*. This crop also appears unsuitable to Rhodesian conditions. Always severely attacked by Aphis, and not equal to cowpeas, soya beans, dolichos beans, etc., in vigour of growth and yield per acre. Perhaps better adapted to more arid areas, but has shown no promise on the Bulawayo or Gwelo Experiment Stations.

NAMBYQUARA GROUND NUT (*Arachis nambyquara*).—A very large-seeded type of ground nut introduced from South America. Requires a long growing season, and the climate of Rhodesia is too cold for it. May prove useful as a parent in plant breeding work on this crop where a large-kernelled type is the objective.

QUEENSLAND LUCERNE (*Stylosanthes mucronata*).—An annual legume common on the coastal slopes of Queensland and said to be a valuable herbage plant. Without irrigation it has failed to survive the dry months of winter, and would not appear worthy of a place amongst the irrigated pasture plants of the Colony.

SAINFOIN (*Onobrychis sativa*).—There is no record of this herbage plant having proved successful anywhere in Rhodesia. Soils are possibly too acid. Will not survive the dry winter unless irrigated, and under irrigation does not do as well as lucerne and certain of the clovers.

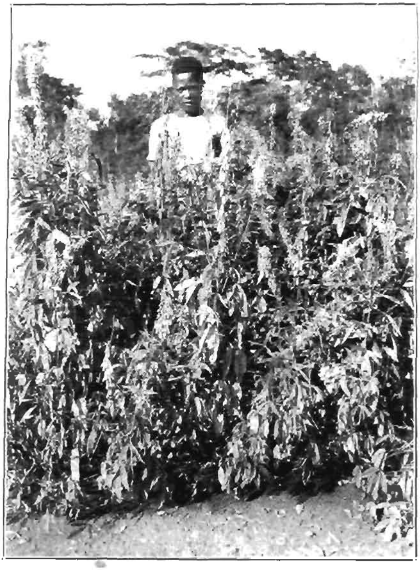
SERRADELLA (*Ornithopus sativus*).—An annual legume to which the same remarks apply as for Sainfoin, except in respect to soil acidity.

SOUR CLOVER (*Melilotus indica*).—Grows with great luxuriance on irrigated land, but is not equal to other melilots

Vi Vi.—14 months' growth from the planting of the seed in January, 1931.

Locust Bean Tree.—Five years old from date of planting-out on Salisbury Station.

Vi-Vi. Showing flowers and seed-pods.



Crotalaria usaramoensis in full flower and seed.

as a fodder crop. Liable to become a troublesome winter weed in irrigated land which is constantly sown to cereal crops. In its green state is not palatable to cattle.

SULLA or **SULLA-CLOVER** (*Hedysarum coronarium*).—Same remarks apply as to Serradella.

TEPARY BEAN (*Phaseolus acutifolius*, var., *latifolius*).—A very quick-maturing bush bean producing a small white seed of the haricot type. Yields well, but the plant only attains a height of 6-9 ins., and is therefore laborious and costly to harvest. A good catch crop for sowing late in the season or under a restricted rainfall. Does well on virgin soil, and for some years enjoyed considerable popularity. Is not favoured on overseas markets, but produces a palatable dry bean for local consumption.

TREE LUCERNE (*Medicago arborea*).—Has not been grown with success on the Salisbury Station, and as a fodder plant is not usually relished by stock. One case is reported where the plant is cultivated successfully to provide green feed in winter for poultry. Is not considered worthy of attention except, perhaps, for the latter purpose. Benefits from winter irrigation.

VETCHES (*Vicia spp.*).—A large number of these have been tested, including *V. sativa* (common), *V. villosa* (hairy), *V. narbonnensis* (narbonne), *V. angustifolia* (narrow leaf), *V. dasycarpa* (woolly pod), *V. monantha*, *V. atropurpurea* (purple), *V. sitchensis*, *V. fulgens* (scarlet), *V. cracca*, *V. calcarata* (Bard) and *V. pannonica* (Hungárian). The vetches fall into that group of plants which will only grow readily in Rhodesia as winter crops. Under such conditions and given irrigation, they mostly do well, and also show some promise as winter crops on wet vlei soils. Combined with late-maturing oats to provide green fodder or grazing for sheep, they may later find a place amongst the general crops of the Colony. For these purposes the most promising varieties are:—*V. sativa*, *V. Villosa* and *V. atropurpurea*. "Crown vetch," *Caronilla varia*, recently introduced by courtesy of the United States of America, is undergoing preliminary trial. Its appearance is not that of a true vetch.

VI-VI (*Lucaena glauca*).—A small leguminous tree introduced from Queensland. In Rhodesia it attains a height of 6-14 ft.; is said to be a valuable browsing plant. Grows readily, seeds profusely and the young branches and seed-pods are freely eaten by stock. Seems particularly to like the Kalahari sandstone formation, on which type of soil it may well prove of value. In Queensland the fodder is said to contain as high a percentage of protein as 25.75 per cent. Seed should be steeped in hot water before sowing. Can be sown *in situ* or transplanted.

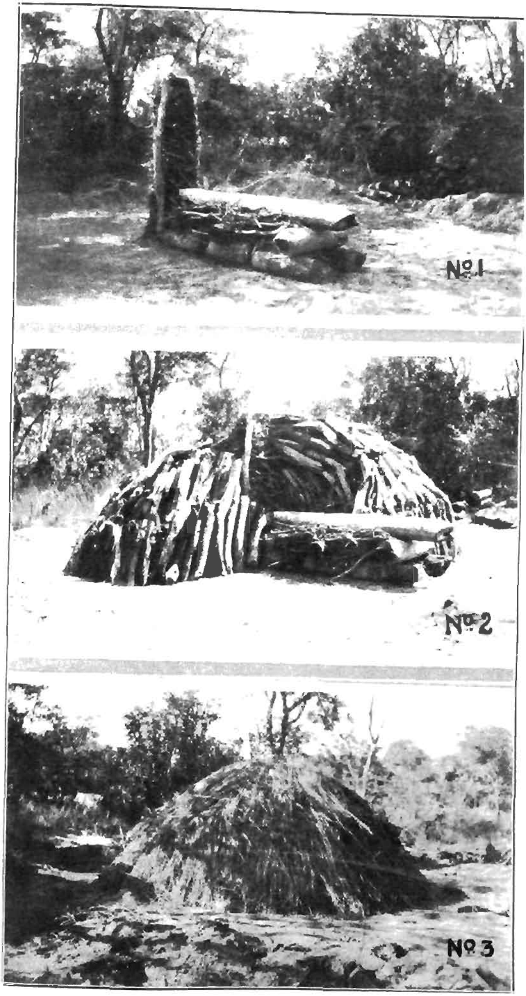
YAM BEAN (*Dolichos bulbosus*. Syn.: *Pachyrhizus tuberosus*).—Does not appear at home in Rhodesia. Seed has germinated well, but one plant after another for no observable cause has died off, until none have survived. Fruits very sparingly.

WOOLLY PYROL BEAN (*Phaseolus sp.*).—A procumbent type of bean which makes very little growth and appears to be without local importance.

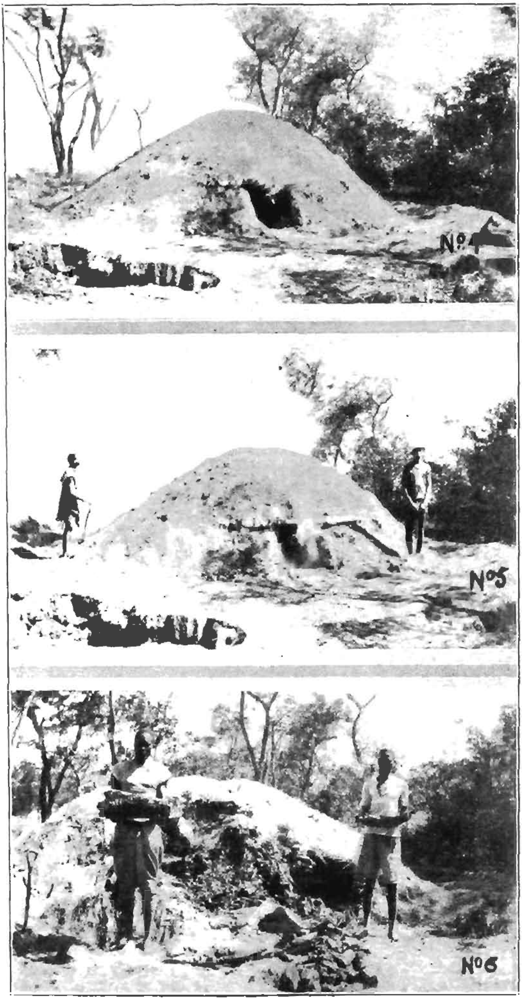
(To be continued in next issue.)

HANDBOOK OF TOBACCO DISEASES.

Attention of readers is drawn to the fact that the Department of Agriculture has found it most inconvenient, with the present shortage of staff, to handle the local sales of this book. Arrangements have therefore been made with the Rhodesian Printing and Publishing Company for distribution by them throughout Southern Rhodesia. The book may be obtained from the Herald Store, Salisbury, price 4s., or, postage paid, 4s. 4d.



(1) Shows flue and firing chamber.
(2) Method of stacking. (3) Thatched kiln.



(4) Kiln covered with earth.
(5) Firing the kiln. (6) Opening the kiln.

CHARCOAL BURNING ON THE FARM

By R. J. Allen, Forester, Rhodes Matopo Estate, Matopo School of Agriculture and Experiment Station.

Wood charcoal may be used for numerous purposes on the farm. The chief uses to which it is put are:—It is a cheap source of power for running suction gas engines, smelting and smithy work. In a crushed form it is also fed to poultry.

Wood consists chiefly of the carbohydrate cellulose and lignin, and by burning or subjecting to a high temperature, without free admission of air, most of the organic substances can be driven off, leaving a residue of impure carbon called charcoal.

The manufacturing of charcoal is a very simple operation. There are two ways in which this may be done. These are:—(1) in a hole in the ground; (2) in a kiln.

The first is a time and labour wasting method. Even where wood has no value, it should never be employed. Half of it is burnt to ashes and cannot be used.

A hole is dug in the ground, four feet deep, six feet long and four feet wide. Dry grass and branches are placed in this and set alight. A quantity of dry wood is added and allowed to burn well. When this has been reduced to embers, more wood is placed in the hole and the process repeated until it is full of glowing embers. It is then covered with green grass and earth to a depth of twelve inches, and left for twenty-four to thirty-six hours to cool, before the charcoal can be removed.

Burning in a Kiln—Species and size of Wood used.—Some woods burn quicker than others, and for this reason only one kind should, if possible, be burnt in a kiln. Should two or more be burnt in the same kiln, it may happen that

the one has over-burnt or turned to ashes before the other is ready to be removed.

In the kiln shown in the accompanying photographs the kind of wood used was *Burkea africana* (umnondo or *mukarati*). The results were excellent.

The size of the wood varies in accordance with the shape of the kiln. In the illustrations is shown wood which was cut into lengths two feet long by three to six inches in diameter.

Shape and Size of the Kiln.—The shape of the kiln is that of a paraboloid, i.e., resembling a cricket ball cut in half.

In size, this is twelve feet in diameter at the base and four feet high. Before attempting to burn in kilns larger than this, one should first gain a little experience. This is best done by keeping to the size mentioned.

Construction of the Kiln—Flue and Firing Chamber.—Select a spot which is level and sheltered from strong winds. To construct the flue:—(1) Clear and level the ground; (2) describe a circle twelve feet in diameter; (3) cut three poles, each five feet long and three inches in diameter; (4) drive these one foot deep into the ground, twelve inches apart, in the form of a triangle in the centre of the circle; (5) within these poles place a layer of dry grass. On top of this place a layer of dry kindling wood; both these layers should be approximately one foot deep; add one layer of dry grass; fill up to the tops of the poles with dry kindling wood.

To construct the firing chamber:—(1) From two of the poles, forming one side of the flue, draw two parallel lines twelve inches apart, in the direction of the prevailing wind, to the edge of the circle; (2) cut nine pieces of wood, each fifteen inches long by nine inches in diameter; (3) lay three of these lengthwise, at intervals, on each of the two lines; across each of the three pairs lay one of the three remaining pieces; (4) cut a log five feet long by nine inches in diameter; place this so as to rest on top of the three crosspieces, the outside end being immediately above the circle; (5) in the enclosed space thus formed, pack as much dry grass and kindling wood as it will contain. This must connect up with the kindling in the flue.

Stacking the Wood.—Use only dry wood from which the bark has been removed. The wood is stacked in three tiers, completely enclosing the firing chamber and flue, the firing point and the top of the flue not being covered in. The larger pieces are placed in the centre of the circle round the flue. In the first tier the billets are placed on one end and stand erect. In the second tier the billets rest on top of those in the first and are inclined upwards, towards the flue, at an angle of about 60 degrees. On top of this is placed the third tier. In this the billets are laid flat.

All the wood must be packed as close as possible, and all spaces should be filled in with dry kindling wood, from which the bark must be removed.

Thatching.—Having stacked the wood, the next thing to be done is the thatching. This is done with green grass, or, if none is available, use grass which has been damped with water. The grass is not tied down, but is placed on loosely to a depth of six inches evenly, leaving none of the wood exposed. Commence thatching from the bottom and work upwards. This will prevent the tips of the grass from standing erect and enabling the earth covering to slide through in places. The top of the flue and the outside end of the firing chamber are left uncovered.

Covering with Earth:—

(1) To prevent its being stopped with earth, cover the top of the flue with a bucket turned upside down.

(2) Using three short, stout pieces of wood about ten inches in diameter, build an archway in front and round the mouth of the firing chamber to prevent earth sliding down.

(3) Commence digging three feet away from the base of the kiln and work outwards. The soil should be well pulverised and contain no stones or clods. With this, cover the kiln to a depth of two feet at the bottom, working up to the top, where it should not be less than fifteen inches thick. This must be well firmed by patting with a spade.

Firing the Kiln.—This is done at sunrise. First remove the bucket covering the top of the flue, and then set alight at the entrance of the firing chamber. It is necessary to keep a good fire going, and as soon as the material in the chamber

has been burnt out, more must be added. This must be kept up for at least three or four hours to ensure thorough firing. When this has happened, seal the mouth of the firing chamber and the flue with green grass, or green branches and earth. The kiln must now be watched. Where it shows cracks or has fallen in, beat the covering down and add more earth. Where it is not burning, lead the fire by making a hole in the covering about twelve inches square and open up the grass. Open the mouth of the firing chamber a little bit for a short while. This will draw the fire to the required spot. Close the holes again.

Time required to Burn.—A rough guide to the above is one day to each Cape ton of wood in the kiln. To ascertain this, make use of the following formula.

Assuming that mukarati weighing 48 lbs. per cubic foot (air-dried) is used to make a kiln having a basal diameter (d) of twelve feet and a height (h) of four feet, then the volume (v) of the kiln, which is in the form of a paraboloid, is calculated thus:—

$$v = \frac{d^2\pi}{4} \times \frac{h}{2}$$

$$= \frac{12 \times 12 \times 3^1/_7}{4} \times \frac{4}{2}$$

= 226 cubic feet (less 5 per cent., as shape is not usually a true paraboloid)

= 215 cubic feet.

Weight of wood is 215 x 48	=	10,320 lbs.
	=	5 tons (approx.)
Therefore, time taken to burn	=	5 days.
Allowed to cool down	=	2 days.
Total		7 days.

It may be taken that wood in reduction to charcoal loses about 50 per cent. of its volume and 75 per cent. of its weight, so that the above-mentioned kiln will give about 2,500 lbs. of charcoal.

Opening the Kiln.—When the kiln has cooled down sufficiently it may be opened, care being taken that it does

not blaze up. To prevent this happening it is necessary to have a few buckets of water ready for use, or if none is available, smother the flames with earth and leave for a day or two longer before opening again. Place the charcoal in three or four heaps, as a chance spark may cause a blaze which can more easily be extinguished in a small heap than in a large one.

The best time to open a kiln is at night, when any sparks can be seen at once.

General.—Only sound and not rotten wood should be used. Charcoal, which is reddish-brown in colour, is not completely carbonised.

Dull colour and softness also indicate over-burning and use of rotten wood.

Careful and slow burning yields a better quality and greater quantity of charcoal.

A good charcoal gives a metallic sound when struck, and should not soil the hands.

Photographs.—

(1) Shows flue and firing chamber.

(2) Method of stacking.

(3) Thatched kiln.

(4) Kiln covered with earth.

(5) Firing the kiln.

(6) Opening the kiln.

REPORT OF THE CHIEF ENTOMOLOGIST

FOR THE YEAR ENDED 31st DECEMBER, 1931.

AGRICULTURAL.

No serious outbreaks of insect pests attacking agricultural crops occurred during the year under review. A few small outbreaks of army worm (*Laphygma exempta*, Wlk.) were reported from Bindura, Umtali, Fort Victoria and Rusape in January. An outbreak occurred on irrigated land in June on a farm in the Melsetter district. Another small outbreak occurred in December in the Sinoia district.

1. *Maize.*—The maize stalk borer (*Glottula fusca*, Full.).—Tests of "Derrisol" showed a 91 per cent. kill of the young larvæ in a trap crop of small maize plants. Further tests showed treated rows to be infested to the extent of 16 per cent., with an average of 0.25 larvæ per plant, while untreated plants were 97 per cent. infested, with an average of 5.38 larvæ per plant.

Emergence of moths of the second brood occurred during the latter two weeks of February. Emergence of moths from the over-wintering brood commenced on the 25th November, nine days earlier than last year. The main emergence occurred during the second week in December. The pupal period was 19 days, and the eggs took 10-11 days to hatch.

Other insects prominent on maize during the year included (1) maize root worm (*Apophyllia murina*, Gerst.) in Concession and Mazoe during January; (2) snout beetle (*Systates exaptus*, Mshl.) at Mount Hampden in December, and (3) *Margarodes* (an underground scale on roots) at Rusape and Salisbury during March and October respectively.

2. *Root Gallworm (Heterodera radicicola).*—The rotation experiments laid down in the 1929-30 season were continued according to the initial plan. Each dry season the lands receive double ploughing, and special attention is paid to

weed suppression during the growing season. Both the susceptible seed crop and tobacco showed heavy infestation on land previously cropped with maize. Cotton, Sunn hemp and Florida bunch velvet beans were not infested.

Infestations of a white fly (*Fam. Aleyrodidæ*), previously recorded on tobacco in 1927, coincided with the appearance of a virus disease known as leaf curl on tobacco in various parts of the Colony from November. There have been a few severe infestations of cutworm, and stem borer (*Phthorimæa heliopa*, Lw.) has done considerable damage in certain localities.

3. *Citrus.*—A severe attack by thrips (*Scirtothrips aurantii*, Faure) was experienced in September and October, but satisfactory control was obtained by spraying with lime sulphur. Conditions during the rainy season 1930-31 were favourable to the spread of red scale (*Aonidiella aurantii*, Mask.), which increased rapidly when efficient control was not carried out. Damage by the cotton bollworm (*Heliothis obsoleta*, F.) and aphis (*Aphis tavaresi*, Del.G.) was unusually light. False codling moth (*Argyroploce leucotreta*, Meyr.) shows signs of increasing, but is not yet a pest of serious economic importance. A parasite (*Glypta leucotretæ*, Wilk.) of this pest was discovered during the year, and has since been described as a species new to science. This information has been obtained through the courtesy of the Director, B.S.A. Company's Citrus Experimental Station, at Mazoe.

4. *Cotton.*—Owing to the comparatively small areas planted to cotton, records of pests mostly come from the Cotton Breeding Station, Gatooma. One brood of the American bollworm (*Heliothis obsoleta*, F.) was evident during March. Damage by spiny bollworm (*Earias*, sp.) was severe, while only light attacks of jassid (*Empoasca fascialis*, Jacobi) were reported. Heavy attacks of Sudan bollworm (*Diparopsis castanea*, Hamp.) were reported through the season in many parts of the Colony. Cotton stainers (*Dysdercus* spp.) were widespread and numerous, especially on ratooned cotton.

5. *Stored Products.*—Maize.—Unsuccessful laboratory tests were carried out with a view to finding an economic contact spray against maize weevils (*Calandra oryzæ*, L.) infesting granaries and their surroundings.

Tobacco.—No unusually heavy infestations of the tobacco beetle (*Lasioderma serricorne*, F.) were reported. The moth, *Ephestia elutella*, Hubn., mentioned in our annual report for 1929 as attacking Rhodesian tobacco stored in London warehouses, was found in a tobacco warehouse in Salisbury in June, 1930. Since then it has been found in two cigarette factories in Salisbury, but it has not been found in stored products other than tobacco, nor has it been reported outside the capital. Observations on its life history and control have been made. The preventive and control methods recommended in warehouses include scrupulous cleanliness of the premises and early and complete disposal of the crop. The larva is subject to the attacks of a braconid parasite (*Microbracon hebetor*, Say.).

6. *Miscellaneous.*—(1) The maize weevil (*C. oryzæ*, L.) was found attacking apples in two orchards. (2) A weevil, believed to be *Cylas compressus*, Hartm., was reported in Southern Rhodesia for the first time in October. It was found attacking sweet potatoes in Salisbury. (3) The mealy-bug (*Pseudococcus nipæ*, Mask.) was recorded, for the first time in Southern Rhodesia, on palms in Salisbury. (4) The burnished brass moth (*Phytometra orichalcea*, Fabr.) was reported destroying various crops, chiefly sunflower, in several centres. The infestation died out in February, parasites and disease playing a large part in its suppression. 1919 chalcid parasites were reared from one larva. (5) The scale-insect (*Ceronema africana*, Macfie.) was recorded for the first time in Southern Rhodesia on cultivated fig.

7. *Locusts.*—The territory has been entirely free from locusts during the past year.

MEDICAL AND VETERINARY.

Tsetse Fly.—There has been little change in the general tsetse fly position during the year under review. No major extensions of the main (*Glossina morsitans*, West.) fly belt have been recorded, except in two portions of the low-lying Zambesi Valley, one in the Darwin district and the other in the Sebungwe district. Reliable information is difficult to obtain from such isolated areas, and the spread recorded may have taken place in previous years. No natural retrocession of the fly areas has been recorded during the year. During

the dry season a careful inspection was made of that portion of the Darwin district lying between the Ruia River and the escarpment, where severe losses from animal trypanosomiasis have occurred in the past, and which was previously considered to be permanently infested with fly.

The observations indicate that no "fly" are permanently settled on the high veld south of the escarpment in this district, and have established conclusively that "fly" are continually being carried into the area by game and native pedestrians coming up from the heavily-infested areas lying at the foot of the escarpment. A similar inspection, carried out in the Lomagundi south-west area, indicates a slight retrocession of the "fly" towards the Umfuli River. The total area at present occupied by fly is now roughly 22,000 square miles.

No new game fences have been erected during the year, though financial provision was made for extra fencing in the Gatooma area. A third fence, 10 miles west of the present western game fence, was proposed in order to make the game-free buffer zone 20 miles wide, experience in Lomagundi having shown that a 10-mile wide buffer zone is too narrow.

The shooting operations against game, controlled by the Entomological Branch, have been maintained in the Lomagundi (Umboe), Lomagundi S.W. and Gatooma areas. A small saving in expenditure was made by reorganising the native hunters and also by providing arms and ammunition to unpaid native hunters, who operate under supervision.

In order to intensify the operations against game in the Wankie district, a European ranger has been placed in charge of the area, with a staff of 20 paid native hunters. He also exercises general supervision over the unpaid native hunters previously controlled by the Native Commissioner, Wankie, as well as the guards in charge of the three cleansing chambers erected in this area.

The native hunters employed by the Entomological Branch destroyed 6,502 head of game during the year, while the native hunters under the control of the Native Department destroyed 8,565 head, making a total of 15,067 head. This heavy sacrifice of wild life, and the lack of permanency in the results obtained, emphasises the extreme desirability

of providing for a fully staffed and well equipped research station as soon as the requisite financial provision can be made.

Dr. G. H. Hale Carpenter was invited to visit Salisbury on his return in February from investigating the tsetse fly problem in Bechuanaland. Unfortunately, owing to heavy rains, he was unable to inspect any of our tsetse fly areas. His visit was greatly appreciated, and much valuable information about the position in Ngamiland was obtained.

Mr. C. F. M. Swynnerton, Director of Tsetse Fly Research, Tanganyika Territory, visited the Colony in June and spent several days in the Gatooma fly belt, where trapping experiments were being carried out. The whole problem was thoroughly discussed with him, particularly the question of producing natural thicket barriers.

The benefit derived from such visits is invaluable.

A departmental committee of enquiry to consider the whole tsetse fly problem was appointed in July and took evidence from the public. Its findings are still under consideration by the Government.

1. *Operations, Lomagundi (Umboe).*—Operations against game under the control of the Entomological Branch were commenced in 1926 on the completion of the first fenced zone in December, 1925. In 1928 a third parallel fence was constructed 10 miles north of the old fenced area, creating a zone roughly 20 miles wide, in which intensive shooting operations have been maintained. The operations were extended in February, 1930, to include an area west of the Angwa River. Within the southern fenced zone fly is now extremely scarce, and not one has been caught in this area during the year, except at the traffic control station on the Tchetchenini road. Within the northern fenced zone, an area which in the past was heavily infested, the density of fly has been very considerably reduced. Flies are still present in the vicinity of the Duwe River, and within a mile or so of the northern fence, particularly along the Rukute and Winde Rivers. These are considered to be intruders from the north. No search has been made for puparia during the past two years within this northern fenced zone, though breeding probably still occurs.

The average density of fly north of the fenced zone, where the game is undisturbed, is represented by a figure lower than that recorded in 1930, which was in turn lower than the figure in 1929. This progressive decline is difficult to explain. There is very little game in this area, water is scarce during the dry season, and the country is more broken than the area within the fences. Permanent water and good early grazing is found within the fenced zone on the Winde and Rukute Rivers and their small tributaries. These areas, now inside the fenced zone, were in the past well stocked with game, particularly at the end of the dry season, most of the animals possibly being migrants from further north. Now that the permanent water and early grazing have been fenced off, a change may have taken place in the annual migration of game towards the well watered vleis around Chauka Hill, and this in turn may account for the decreased density of fly north of the fenced zone.

The distinct improvement mentioned in previous reports has been maintained, no serious losses of stock from trypanosomiasis having been recorded from this district during the year. A few new cases have, however, occurred on Robbsdale.

2. *Operations, Lomagundi South - West.*—Operations against game, in charge of a European ranger, were commenced in this area in 1930, after construction of a 40-mile -long game fence west of the occupied farms. The ranger has also taken over local supervision of the native hunters previously under the control of the Native Commissioner, Sinoia. Fairly complete density counts of fly have been made during the year, and a slight retrocession of the fly belt towards the Umfuli and Umniati Rivers has been indicated. Very few new cases of trypanosomiasis have been recorded from farms in the Gambuli Valley and, on the whole, a distinct improvement has occurred in this area following the initiation of these operations.

3. *Operations, Gatooma District.*—Intensified and controlled shooting has been in progress in this area since September, 1927. The area of operations was extended in 1930 to include certain farms and Crown lands on the north-east, and later, in 1931, an area south of the Umniati River. The number of game destroyed each month has tended to increase,

probably owing to the larger area covered, part of which lies outside the fenced zone. Inside the fenced zone very little big game remains, but small buck and warthog are still numerous. The creation of a totally game-free buffer zone is perhaps an impracticability.

Two comprehensive series of density counts have been made in this area during the year, one at the end of the wet season and one towards the end of the dry season. These indicate a continued reduction in the density of fly over the whole area.

Fly is, however, still dense at certain localities near and inside the western fence. Continued infiltration of fly from outside the fenced zone is suspected. How far such infiltration occurs inside the fenced zone is not definitely known, but it is suspected that a few flies may range across the full 10-mile buffer zone. The operations in Lomagundi have clearly indicated that a 20-mile wide buffer zone is necessary before satisfactory results are obtained from operations of this nature.

On two farms in the Gatooma area, close to the eastern fence, the use of oxen is still uneconomic owing to heavy and continued losses from trypanosomiasis. On most of the farms where deaths have occurred in recent years the disease still persists, but the general improvement indicated in last year's report has been maintained.

4. *Operations, Wankie District.*—The course of events in this district has been of particular interest. As is well known, the fly by the year 1918 had advanced sufficiently far to affect cattle along the west bank of the Gwaai River. At that time there was a definite but comparatively light infestation on the south-west side of the Shangani, extending from near the Gwaai-Shangani junction for a distance of some 30 miles up the Shangani. Towards the end of and after the operations against game in this area commenced in 1919, namely, in 1922 and 1923, very little game and no flies could be found south of the Shangani, and the losses of cattle on the Gwaai River ceased. The operations were discontinued after the year 1922, and a system of shooting concessions was substituted, which proved ineffective. Game began to increase again, and this was followed by increase and renewed spread

of fly. On the basis of reports received, a recrudescence of trypanosomiasis in the Gwaai River was prophesied in 1927, and towards the end of that year this prophecy was fulfilled. The area south of the Shangani was traversed by the Chief Entomologist in 1928, and this visit was followed by a detailed survey on the part of an experienced field assistant. The position in 1927 was apparently comparable with that in 1918, judged from unofficial reports and the incidence of trypanosomiasis on the Gwaai River. The official observations in 1928 confirmed the reports of great increase of game, and increase and spread of fly, which was by then present in some numbers throughout the previously mentioned tract south of the Shangani River. Whereas in 1919 vigorous operations were undertaken against game, whilst the area south of the Shangani was only lightly infested, no such operations were undertaken in 1927 or 1928, certain alternative measures being given precedence. The sequel appears to be sufficiently significant. The fly, instead of disappearing, or, at all events, becoming evanescent, between the Shangani and Gwaai Rivers as previously, has increased so greatly in that area that at the time of the density counts (October, 1931) certain localities showed an infestation denser than anything yet encountered by officers of this branch within the Colony. The highest figure actually recorded was four hundred and thirty-nine (439) flies caught with one net in three hours, but other records are nearly as high. In addition, the fly has, of course, spread much further afield and definitely infested a considerable section of the Gwaai River Valley.

A few more farms were taken up during the year by European farmers on the settlement along the Gwaai River. The general fly position along the Gwaai River became worse rather than better during the early part of the year, and in July the operations against game were intensified by the appointment of a European ranger and 20 paid hunting boys. These boys were distributed along the Shangani River and around the junction of the Gwaai and Shangani Rivers. The native hunters under the control of the Native Department are distributed along the Gwaai River. The European settlers with their hunting boys operated freely over the open area and did not entirely confine themselves to hunting within the vicinity of the settlement. Their efforts were sporadic and

uncontrolled, and their effect on the general position ineffectual. Since the appointment of the ranger and the provision of controlled and intensified shooting, there has been a considerable decrease in the number of game in the area, accompanied by a great reduction in the number of fly along the Gwaai River. Fly is present along the Gwaai Valley for a number of miles above the Gwaai bridge as to make farming with oxen an impossibility. Several years may be required to clear the area of fly and to make the settlement farms safe for domestic stock. Until these farms are safe for stock, no development of a permanent nature can be expected.

5. *Operations under control of the Native Department.*—These operations have been continued during the year. No very clear or definite results have been obtained to date, though no reports have been received of fly spreading or increasing in areas where these operations have been in progress. In the Darwin district the number of native hunters has been doubled in order to intensify the campaign, and the operations have been extended to the low veld north of the escarpment to check the fly spreading into the low-lying country east of the Mvouradonna Mountains. In the Sipolilo Native Reserve the improvement mentioned in previous reports has been maintained, although it is still dangerous to introduce stock into the northern portions of the reserve.

No extension of the fly belt has been recorded in the Miami district or the Urungwe Reserve, and no significant improvement in the position can be reported. The same may be said of the position in the Buhi, Wankie and Sebungwe native districts.

6. *Melsetter District.*—In 1929 one specimen of the tsetse fly (*G. pallidipes*, Austen.) was caught on the Rhodesian side of the border close to the farm Chikore, situated within a few miles of the border. There is nothing to indicate that fly has since become established anywhere within the Melsetter district. Considerable losses from trypanosomiasis have, however, occurred on a number of farms in this district during the past year.

7. *Control of Traffic from the Fly Areas.*—There were seven stations for the control of traffic leaving proclaimed

fly areas functioning at the end of the year. One station was closed down. One station was erected, but not in operation before the end of the year.

(a) *Robb's Drift Road, Gatooma.*—Last year 414 flies were caught at this chamber in nine months. This year 687 flies were caught in twelve months. A considerable amount of traffic is handled at this station, the road being much used by hunters and prospectors and by native pedestrians from the Sebungwe district. During the year 205 cars, 332 cyclists and several hundred pedestrians passed through the chamber. Of the total of 687 flies caught, 334 flies (163 males, 151 females and 20 unidentified) were taken off motor cars, and 353 flies (168 males, 151 females and 34 unidentified) from cyclists and pedestrians. The approximate female percentage of the flies caught off motor vehicles was 47, and off cyclists and pedestrians, 48.

(b) *Tchetchenini Road, Lomagundi (Umboe).*—During the twelve months 120 motor vehicles, 1,349 cyclists and several hundred pedestrians passed through the chambers. Ten flies (4 males, 4 females and 2 unidentified) were caught by the guards.

(c) *Mcheringe Road, Lomagundi (Umboe).*—This station was dismantled in June and the road closed to motor traffic, only two flies having been caught in sixteen months.

(d) *Miami-Zambesi Road.*—This station was also in operation during the whole twelve months, during which time 246 motor vehicles, 50 cyclists and several hundred pedestrians passed through the chamber. The guards caught 92 flies off motor vehicles and 83 flies off cyclists and pedestrians, totalling 175 flies for the year. There is very little traffic on this road during the wet season.

(e) *Sinoia-Copper Queen Road.*—A European was stationed on this road for six months during 1930 to collect information regarding the amount of traffic using this road and to examine all traffic for tsetse flies. As a result it was decided not to erect a cleansing chamber on this road.

The reopening by hunters and prospectors of Linscott's old road leading across the Umfuli and Umniati Rivers created a very real danger of flies being carried into farms in the Gambuli Valley, and in July a decision was made to erect a

cleansing chamber on the Copper Queen road near the boundary of Kanyaga Farm.

Native guards were posted in November. Three cars passed through the chamber by the end of the year, but a large number of native pedestrians were examined. Only 8 flies were caught during the year, 3 on cars before the chamber was erected and 5 (1 male and 4 females) on pedestrians and cyclists.

(f) *Bulawayo-Victoria Falls Road.*—Following the detailed inspection of this area made in 1930, it was decided early in the year to erect two cleansing chambers on the Bulawayo-Victoria Falls road, one in the Dett River Valley about 14 miles from Dett Station, the other on Farm 115, approximately 16 miles east of the Gwaai bridge. Guards were posted in July, and the following amount of traffic passed through the chambers:—

(i.) *Dett River Station.*—This station is situated about seven miles from the Gwaai bridge—a fairly dense fly centre. Three hundred motor vehicles, several hundred cyclists and pedestrians and a number of pack animals passed through the chamber. A total of 230 flies (99 males and 131 females) were caught by the guards, 5 of these were caught off pedestrians and 225 off motor vehicles.

(ii.) *Farm* 115 *Station.*—Fewer flies were caught at this chamber than at the Dett River chamber, Farm 115 being further than the Dett chamber from the fly centre around the Gwaai bridge. Two hundred and eighty-three motor vehicles, several hundred cyclists and pedestrians and a few pack donkeys passed through the chamber. One hundred and twenty-eight (128) tsetse flies (55 males and 73 females) were caught by the guards, 110 off cars and 18 off cyclists and pedestrians.

A third chamber for the cleansing of traffic entering the Bulawayo-Victoria Falls road by Walker's road was erected in November, but the guards were not posted until the end of the year.

8. *Experiments with Tsetse Fly Traps.*—The experiments with the Harris tsetse fly trap, various modifications of this trap, and some other models which were reported upon last year have been continued.

Twenty-two (22) traps were used in the experiments, which were carried out at Nyampani vlei in the Gatooma district. Variations in the size and position of entrance slits, the attractiveness of different colours, orientation and position of the traps in relation to the surroundings were tested. Meteorological records, including temperature, relative humidity, wind velocity, cloudiness, etc., were kept. The results have been disappointing in many respects.

Dark blue and black were found to be the most attractive colours, but the efficiency of the traps also varied greatly with such factors as position, amount of movement in the vicinity, seasonal and daily meteorological conditions and the concentration of fly around local dry season foci.

The largest numbers were caught in August and September; in October the number caught gradually decreased. After the commencement of the rains the catches became almost negligible.

The maximum daily catch was made in August, when one trap caught 164 flies (90 males and 74 females). This trap caught 930 flies (491 males and 439 females) in September (an average of 31 per day), 274 flies in October (an average of 9 per day), and 10 flies in 22 days in November (an average of 0.45 flies per day). The average daily catch of 17 traps in November was 0.4 flies.

There does not appear to be any correlation between the average density of fly over the whole area and the catches made by the traps when left unattended. The average of a number of standard density counts, i.e., male flies caught per net per boy per hour, was 31 in August, 27 in September, 27 in October and 20 in November. A boy could, therefore, in November catch twice as many flies in one hour with a net as the best trap caught in a month. Movement is a much greater attractive force than a stationary object.

As a result of these experiments, which confirm the results obtained in 1930, it is considered that present known methods of trapping will not eliminate *G. morsitans* in Southern Rhodesia. Even in selected areas of fairly high density the numbers caught were quite insignificant compared with the total numbers of fly present in the area.

9. *Reconnaissance and Investigation.*—Detailed reconnaissance surveys were made in two areas to plot the approximate limit of the fly belt.

(i.) *Urungwe-Miami.*—This survey re-determined the limits of fly north of Miami and east of the Miami-Sinoia road. No expansion of the belt was recorded.

(ii.) *Darwin.*—This survey established the fact that tsetse were being carried up the escarpment by pedestrians and game coming up from the heavily infested country at the foot of the escarpment. Fly has not yet become established on the high veld south of the escarpment in this district.

Screw Worm Investigations.—Since its first serious appearance in the Mazoe Valley in the wet season of 1918-19, the screw worm fly (*Chrysomyia bezziana*, Vill.) has become a pest throughout the Colony, causing serious losses in most ranching districts. The habits and life history of the fly were studied by an entomologist in the Balla Balla area from February to May. The incidence and contributory causes of wound myiasis in cattle, horses and sheep were also investigated.

Female flies were frequently observed in nature feeding upon blood and septic liquids exuding from cuts, bruises and other wounds in cattle. Only one male fly was found, viz., among blow flies feeding upon the sweet-scented secretions ("honey-dew") on a paspalum grass infected with ergot. Female flies are strongly attracted to screw worm infested wounds, which always possess a characteristic powerful odour. No screw worm flies were seen at purulent wounds. Oviposition was witnessed mostly in the neighbourhood of kraals, where cases of myiasis were treated, but several flies deposited eggs on wounds of an animal used for experiments in a darkened stable.

The eggs are usually laid at the edge of wounds, and not on the unbroken skin. The female deposits the eggs in several batches of about 150 in each, using a sticky secretion of the accessory glands to fasten the batches securely to the skin. Hatching takes place in 12-18 hours or longer. The larvæ feed on blood and septic exudations around the wound, and usually do not invade the living tissues until after the

second moult, i.e., about 2-3 days after hatching. In about 6-7 days from the time of hatching they are full-fed. They then drop to the ground, where, after an interval of 2-3 days, they pupate about half an inch under the surface. The duration of the pupal stage varies from about a week in the hot weather of February to 27-35 days in the winter months of June and July. No parasites of the larvæ or pupæ were discovered. Small *Pheidole* ants carried off small larvæ which were removed from wounds during treatment in the kraals.

Cows and young stock were chiefly attacked. Over 60 per cent. of the wounds were considered to have originated in heavy infestations of the bont-legged tick (*H. ægyptium*). Faulty branding and dehorning sometimes resulted in severe cases. A few cases occurred in trek oxen and bulls. The accidental breaking of horns, "ingrowing" horns and "poking" were responsible for many cases among steers. Several cases of myiasis in black-head Persian sheep were found to be due to both *C. bezziani* and the blow fly, *Lucilia cuprina*, Wied. One case occurred among horses.

The substances commonly used by ranchers as larvicides, e.g., petrol, carbon bisulphide, disinfectants, etc., are not entirely satisfactory, as approximately 65 per cent. of full-fed larvæ removed and discarded from treated wounds are able to complete their development. It is most important that the screw worms be effectively disposed of, otherwise the neighbourhood of kraals where cases are treated becomes a centre of infestation.

Further experimental work is necessary to discover really effective repellents and healing substances for use in cases of myiasis. "Defensol" has been found to be an effective repellent for at least three days.

Although few deaths are directly due to myiasis, the expense of mustering and handling stock for treatment of wounds is considerable, and constitutes a heavy burden on the cattle industry, and the loss in condition of infested stock is often very great.

Attempts to induce oviposition under laboratory conditions in Salisbury failed. Adult flies lived from 3-4 weeks in captivity.

Muscid Flies Affecting Live Stock.—Further observations were made on the habits and life history of muscid flies of veterinary importance, particularly *Musca crassirostris*, Stein., *M. lusoria*, Wied., *M. vetustissima*, Wk., and *M. interrupta*, Wk.

Professor Patton, of the Liverpool School of Tropical Medicine, has collaborated in the study of the morphology of the immature stages of these flies, and also the screw worm fly, *C. bezziana*.

Tobacco Pests Suppression Act, 1931.—In May an Act was promulgated providing for the registration of all warehouses where tobacco is held and prepared for export, for the inspection and cleansing of such warehouses, and for the destruction, where necessary, of tobacco found to be infested with a declared pest.

Licences were granted to twenty-two (22) warehouses after inspection during the year.

The Act has proved both difficult and expensive to administer, and certain amendments to simplify its administration are proposed.

Inter-State Conference on Plant Importation Regulations.—An inter-State conference was held in Salisbury on the 26th, 27th and 28th August with the object of formulating a common policy which should govern the laws adopted by the various States concerned, to regulate the importation of plants and certain plant products. Delegates from the Union of South Africa, Northern Rhodesia, Nyasaland and the Belgian Congo were present at the conference. Principles upon which protective legislation should be based were agreed upon, and, with minor differences governed by local conditions and requirements, the details of uniform regulations were drawn up.

Regulations, based on the decisions of the conference, will shortly be gazetted.

Nurseries Ordinance, 1909.—During the year fifty-two (52) nurseries were registered under the Act, and fourteen (14) were inspected.

The sale of plants from unregistered nurseries has been considerably restricted and the provisions of the Ordinance more vigorously enforced.

Importation of Plants Regulation Ordinance, 1904.—The following consignments have been dealt with by the plant inspectors at the various ports of entry during the year:—

Salisbury	2,230
Bulawayo	10,275
Plumtree	231
Umtali	454
Gwelo	622
Total	13,812

One hundred and fifty-two (152) special permits for the introduction of plants, etc., into the Colony were issued during the year.

Seventy-one (71) annual permits were granted to registered nurserymen in the Union of South Africa.

Regulations in other Countries Affecting Export of Plants from Southern Rhodesia.—Twenty-nine (29) certificates of cleanliness have been issued in respect of plants intended for export to other countries.

Injurious Substances and Animals Ordinance, 1909.—Six (6) certificates for the importation of bees-wax and two (2) for the importation of foundation comb were granted during the year.

Lectures.—Four (4) lectures on agricultural entomology were delivered to the pupils of the Tobacco Experimental Station, two lectures on ticks to the B.S.A. Police and one popular lecture on mosquitoes to school children in Salisbury.

Farms Visited.—Forty (40) farms were visited and advice given by members of the staff.

Agricultural Shows.—An exhibit of insect pests was placed on the Agricultural Show at Salisbury, with one officer in attendance.

Publications.—"Locusts in Southern Rhodesia," by R. W. Jack, Chief Entomologist, in the *Rhodesia Agricultural Journal* for January (Vol. XXVII., No. 1).

Identification of Insects.—During the year over four hundred specimens of insects were submitted to specialists abroad for study. Eighty (80) species were identified by the Imperial Institute of Entomology and the British Museum

(Natural History). Fifty-two identifications were received from the United States National Museum, the American Museum of Natural History, and other institutions.

Staff.—Mr. R. W. Jack, Chief Entomologist, left on vacation leave on the 14th December.

Mr. A. Cuthbertson, entomologist, left on vacation leave on the 27th July.

Miss W. M. Shepherd recommenced duties as clerk-typiste on the 13th April, *vice* Mrs. Slocock, resigned.

Acknowledgment is made of the loyal and efficient services of the headquarters and field staff during the year.

J. K. CHORLEY,
Acting Chief Entomologist.

GWEBI PRODUCE PRICES.

Hull-less oats	40/- per bag of 150 lbs.
Large Black sunflower seed ...	14/- per bag of 100 lbs.
Dolichos beans	35/- per bag of 200 lbs.
Linseed	60/- per bag of 200 lbs.
Linseed (quantities under 100 lbs.)	4½d. per lb.
Sweet potato tubers (Calabash Leaf)	6/- per bag of 150 lbs.
Napier fodder roots	6/- per bag of 40 lbs.
Sweet potato cuttings (Calabash Leaf)	6/- per bag of 40 lbs.
Edible canna corms	10/- per bag of 150 lbs.
Pumpkin seed	1/1 per lb.

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, ***not direct to the Gwebi Farm.***

THE SOFTENING OF WATERS.

By the DIVISION OF CHEMISTRY.

Of the many samples which are submitted to the chemical laboratory by farmers for analysis, a fairly large proportion consists of waters drawn from river, well or bore-hole which are intended for use on the farm as feed water for steam boilers. Many of the samples on examination prove themselves to be quite unsuitable as drawn from the source, and treatment has to be resorted to before the water can be safely applied. It is the purpose of these notes to explain briefly why such waters are unsuitable, and to show the chemical mechanism which converts them into harmless and useful agents for the work which the farmer intends them to perform.

The harmfulness or otherwise of a water depends primarily on whether it contains any substances in solution. Basing the classification upon this fact, all natural waters are divided into two groups—soft waters and hard waters. By soft waters are meant all those waters which contain only minute quantities of soluble solids, and as far as the farmer is concerned, these are the safe waters to use for boiler purposes. Unfortunately, however, the larger proportion of the waters in this country are not soft, but fall under the second heading, and the problem which they present is the removal of the "hardness" and the conversion of the supply to a soft and therefore harmless and useful water.

Hard waters, or waters containing considerable quantities of dissolved solids, are further divided into two classes, with only one of which we shall deal here, as the other is encountered but rarely. These types are "permanently" hard and "temporarily" hard waters, and it is the latter that is of greater importance to the farmers of Rhodesia. This temporarily hard water contains in solution the bicarbonates of calcium and magnesium, and such water presents

considerable difficulties in the formation of a lather with soap. This difficulty is due to the inter-action of the calcium and magnesium salts in the water with the soap to form insoluble salts, which appear as a scum round the sides of the vessel, and until all the calcium and magnesium have been converted into this insoluble scum, no lather will form. It is owing to this fact that the term "hard" has been applied to such water.

In order to understand how such a water may be rendered soft and fit for use, an explanation of how these salts come to be present in the water would be advantageous. One of the constituents of the atmosphere surrounding the earth is the gas carbon dioxide (commonly known as carbonic acid gas), which, though it forms but a small fraction of the air, is exceedingly important in the balance of nature. It is composed of two elements, carbon and oxygen, and is formed when any carbonaceous matter is burned, i.e., oxidised. When this gas comes in contact with water, chemical union takes place, and since water is composed of the two elements hydrogen and oxygen, we now get a new compound containing hydrogen, oxygen and carbon. This compound is carbonic acid, a weak acid which can exist only in dilute solution. Taking the symbols H for hydrogen, C for carbon and O for oxygen, we can write this interaction in the form of an equation, thus:—

$$\underset{\text{Water.}}{H_2O} + \underset{\substack{\text{Carbon dioxide} \\ \text{or carbonic acid gas.}}}{CO_2} = \underset{\text{Carbonic acid.}}{H_2CO_3}$$

Now there are in Rhodesia considerable quantities of limestone formations, many of them appearing as outcrops at the surface and many buried beneath other strata. These rocks contain large quantities of carbonate of lime, a substance practically insoluble in pure water. Most waters, however, as we have seen, dissolve varying quantities of carbonic acid gas, chiefly by absorption from the atmosphere, and when the carbonic acid so formed comes in contact with limestone, the carbonate of lime is converted into the soluble bicarbonate by chemical union with the carbonic acid, and this is immediately dissolved and carried off by the water, giving a temporarily hard water. We therefore have—

Carbonate of lime (Insoluble.) + Carbonic acid = Bicarbonate of lime. (Soluble.)

It is obvious then that, to render this water soft again, means must be found of reversing this reaction and breaking up the bicarbonate into the insoluble carbonate and carbonic acid. There are two chief methods of accomplishing this.

(1) If the temporarily hard water be boiled, the bicarbonate breaks down into insoluble carbonate and carbonic acid, and as the latter decomposes in boiling water, the carbonic acid gas is driven off, thus removing the chances of the newly formed carbonate being again converted into soluble bicarbonate. The carbonate is thrown down on the walls of the vessel as a very fine powder, which gradually accumulates as a scale or "fur," while the water, having now lost its dissolved solids, is soft. The danger in using temporarily hard water in boilers is thus explained, for as such water is boiled there gradually forms on the inside of the plates a thick coating of carbonate of lime. This coating will cause a very considerable loss in the efficiency of the boiler. Further, if this scale cracks when heated—as it frequently does, owing to its having a different rate of expansion from the metal plates—cold water entering the boiler will get through these cracks to the highly heated plates beneath, and the sudden generation of steam so produced may be sufficient to burst the boiler, or at least crack the plates. A further point to be noted in this connection is that when water containing bicarbonate of lime is heated slowly—as, for example, in the initial heating of the boiler—the lime carbonate deposits as the well-known mineral calcite, which forms an exceedingly hard scale and one which presents great difficulty in subsequent removal. Feed pipes may become choked, necessitating the opening of the boiler long before its usual time, and the inlets to water gauge taps may become filled up, thus leading to entirely erroneous gauge readings. If only for these reasons, it is highly inadvisable to use temporarily hard water in any boiler without first resorting to other means of softening it.

(2) Whilst the method of boiling the hard water as a means of softening is quite suitable when one requires only small quantities, it is impossible of application on the large scale required by the farmer. Another method has therefore to be sought—a method which will conform to the specifications of cheapness and ease of application. Such a one has

been found in the method of "liming." When lime interacts with calcium bicarbonate, insoluble calcium carbonate is formed, and consequently when lime (quick or slaked) is added to temporarily hard water, the calcium carbonate will be precipitated, leaving the water soft. Putting this in the form of an equation, we have—

Calcium bicarbonate (Soluble.)	+	Calcium hydroxide (Soluble.)	=	Calcium carbonate (Insoluble.)	+	Water (soft).

The interaction of the two substances on the left-hand side takes place according to definite proportions, for writing this equation in chemical symbols and deducing the interacting quantities therefrom we find that 162 parts by weight of the bicarbonate interact with 74 parts slaked lime or 56 parts quicklime. Hence, by estimating the quantity of bicarbonate in a sample of temporarily hard water, it is possible to calculate exactly how much lime must be added to leave the water soft, i.e., having no surplus bicarbonate of lime left in solutiou.

In practice it has been found that the most efficient arrangement for applying the liming method is to run the hard water into broad and shallow tanks of known capacity. The correct quantity of lime is then added, well stirred in with large poles, and the sludge (chiefly insoluble calcium carbonate) allowed to settle for some twenty-four hours. The clear soft water on the top is then run off and employed as desired, the tank refilled with hard water, fresh lime added, and sludge and lime stirred up as before. A series of tanks can be arranged so that a constant supply of soft water may be obtained. The advantage to be obtained from the use of such soft water will more than compensate for the expense involved in the procuring of lime, preparation of tanks, etc. Moreover, the maintenance costs of running steam boilers will be very greatly reduced, as time and money will not have to be expended on frequent dismantling and scraping of the boiler plates.

INVESTIGATION OF THE BACON INDUSTRY IN SOUTHERN RHODESIA.

Object of the Investigation.—The committee set itself to secure evidence on the following points:—

(1) The quality of the bacon produced locally compared with that imported from the Union of South Africa.

(2) The reasons for any difference in quality should it be found to exist.

(3) Whether the difference between the price of pigs on the hoof and the retail price of bacon was reasonable.

(4) The effect of the importation of bacon from the Union on the local market.

(5) The possibilities for development of an export trade in pig products.

From the 1st to the 9th February (inclusive) the committee visited the bacon factories in Salisbury and Bulawayo which account for 90 per cent. of the factory production in the Colony, and met most of the important retailers and wholesalers in these two centres.

The committee did not inspect the books of the different firms visited, and the conclusions set forth in this report are based on statements made to the committee by responsible persons in the firms named.

The statistical data were supplied by the Government Statistician.

Results of the Investigation.—

(1) *The quality of the bacon produced locally as compared with that imported from the Union of South Africa and overseas:*—

(a) *Union Bacon.*—The evidence given to the committee indicated that, on the whole, the bacon imported from the Union was superior to that produced locally.

The opinion of the retailers in Bulawayo was unanimous on this point, and specimen sides seen by the committee confirmed their judgment.

In this respect the attitude of the retailers in Salisbury differed greatly from that taken by the Bulawayo firms. At the time of this investigation, as far as could be determined, no Union bacon was being sold in Salisbury, whereas approximately 60 *per cent.* of the bacon sold by retailers in Bulawayo was of Union origin. Since bacon from both the large local factories is on sale in Bulawayo, the committee must attribute this difference in the source of the bacon consumed at the two centres to the greater strength of the "Buy Rhodesian" sentiment in Salisbury and to the personality of the men associated with the Neill's Bacon Factory in Salisbury.

The retailers in Bulawayo stated that while some Rhodesian bacon was equal to any of the bacon imported, on the whole it was not as uniform in regard to cure, finish, firmness or weight as the imported article.

In Salisbury retailers were divided on this point. They did, however, state that one side in two or three was not up to trade requirements.

When questioned as to the attitude of the public towards this "unsatisfactory bacon," the general reply was that the public seemed satisfied, though some bacon was occasionally returned. This acceptance by the public of a poor quality product does not encourage the factories to turn out a better article.

(b) *Overseas Bacon.*—The quantity of bacon imported from overseas is insignificant. In 1931 it amounted to 1 per cent. of the amount consumed locally. Because of its keeping quality, it is generally used for the "bush trade," but has no appreciable influence on the general situation.

(2) *Reasons for any difference in quality should it be found to exist.*—The committee is of opinion that the chief reason for the inferiority of part of the local bacon is the unsatisfactory quality of the bulk of the pigs produced in the Colony.

Both the feeding and the breeding of the pigs are at fault. In this connection it is only fair to state that most producers consider the prices paid for pigs of bacon weight

—2½d. to 3½d. per lb. live weight—during 1931 did not justify proper feeding or management. The majority of the producers stated to the committee that at present feed prices the cost of production of pigs was not less than 3¾d. per lb. live weight. Some producers were able to bring carefully compiled figures to substantiate this view. Under present conditions this committee feels that these estimates of costs are not high, but at the same time it would point out that by improved methods of management it should be possible to reduce appreciably these production costs. Since this investigation was completed there has been a rise in the price of pigs without a corresponding advance in the price of feeds, which makes better feeding a more attractive proposition to the ordinary farmer.

Another reason is the lack of grading. A certain amount of grading is carried out at the two factories visited. These factories estimate that about 50 to 75 per cent. of the pigs marketed are suitable for their requirements. While this may be true under existing conditions, the committee is of the opinion that this estimate is much too high when judged by the standards of quality usual in bacon-exporting countries.

It may be pointed out that the factories in the south have an advantage over our local factories in their ability to dispose of inferior grades of bacon economically. They have large supplies of pigs to draw upon, which enables them to grade with greater discrimination than the local factories, and to build up definite grades or brands of bacon, disposing of the inferior qualities at a lower price on the less particular markets.

In this connection it should be emphasised, however, that the disposal of inferior grades of bacon is not always an advantage, as it may tend to reduce the general level of prices, and may, if carried to excess, prevent competing factories from paying a proper premium for first-grade pigs.

Another factor is the alleged unreliable bacon "curing" of the local bacon factories.

Unfortunately the committee has not the necessary experience to make an authoritative statement on this point. It did appear, however, that the facilities at both factories were

good enough to meet the moderately critical taste of local consumers, and that the variations in "cure" pointed out to the committee were more due to carelessness at the factory than to lack of ability to produce satisfactory bacon.

3. *Whether the differences between the price of pigs on the hoof and the retail and wholesale price of bacon were reasonable.*—The data on this point have been separated into:—

(a) spread between wholesale and retail prices of bacon; and

(b) spread between price of pigs on the hoof and the wholesale price of bacon.

(a) *Spread between the wholesale and retail price of bacon.*—It was not possible to get detailed figures relating to the cost of retailing. Most firms appear to treat the sale of bacon, hams and smalls as an integral part of the general grocery business and do not keep separate costs.

The factories are greatly handicapped by the difficulty in disposing of shoulders and hams. This difficulty does not directly affect the retailers who in general handle three-quarter sides as a main line ordering shoulders and smalls separately. Some firms carry the distinction even further and only handle "middles."

Working on the basis of a three-quarter side, which includes the ham, the figures quoted to the committee for retailing, including wastage, delivery and overhead expenses, varied from 2d. per lb. to 5.8d. per lb. of bacon and ham sold. The lower costs, strangely enough, were given by the smaller firms. In each instance the retailer considered his distribution charges to be reasonable.

An important variation lay in the estimate of wastage in cutting up the sides. The figure given for wastage varied from 5 to 20 per cent. of the weight of the side. The soft nature of much of the bacon used locally makes a certain amount of wastage inevitable, a portion of the flank and shoulder bacon having to be cut away and sold at a lower price or discarded. A wastage of over 10 per cent., however, seems excessive to the committee. In this connection the committee understands that a wastage of 3½ per cent. for turn

of scale and evaporation is considered reasonable in the United Kingdom.

Allowing for a very liberal margin in regard to these figures, the committee feels that, on the evidence submitted, the distributing cost should not exceed 4¾d. per lb.

Where the wholesale and retail prices are 11d. and 1s. 6d. per lb. respectively, a fair summary of the retailer's costs of distribution as given to the committee would be:—

Wastage 10 per cent. on 11d.	1.1d.
Overhead charges 15 per cent. on 1s. 6d.	2.7d.
Cash discount 5 per cent. on 1s. 6d. ...	0.9d.
	4.7d.

Excluding contract sales, the average wholesale and retail prices for three-quarter sides quoted to the committee at the time of the investigation are shown in the following table:—

	Bulawayo.	Salisbury.
Average retail price per lb. (¾ side)	1s. 8d.	1s 6d.
Average wholesale price per lb. (¾ side)	11d. to 12d.*	11d.
Average difference per lb.	8.5d.	7d.
Average estimated distributing charges	4.75d.	4.75d.
Profit per lb.	3.75d.	2.75d.

These differences the committee consider too high, and would point out in general support of this view that:—

I. The retailers draw their supplies of bacon almost daily. The turnover is very rapid. Articles dealt with in such circumstances are usually "cut lines," and merchants are required to take a low rate of profit on them. A profit of 1d. per lb. per day on bacon purchased at 11d. per lb. is equivalent to 9 per cent. per day, or over 3,000 per cent. per year, which is exorbitant.

* Excluding a small amount imported from the Union at 1s. 3½d. per lb. and bacon from the United Kingdom.

II. The margin prevalent in Johannesburg in retailers of similar standing is 5d. per lb., as compared with this 7-8.5d. in Salisbury and Bulawayo. Certain retailers in Salisbury cut up and dispose of three-quarter sides at 1s 2d. per lb., which allows a margin of 3d. This is a convenient transaction and presumably not carried out at a loss, but the convenience is hardly sufficient, in the opinion of the committee, to justify a difference of 4d. a lb. in the selling price of whole sides and retail bacon.

High costs are not in the interests of the local industry, and it is suggested that some good might result from the publication of the facts just stated.

When questioned as to the possibility of the increased consumption of bacon if the retail price were lowered, most retailers expressed the opinion that not much difference in consumption would result.

For a semi-tropical country, the *per capita* consumption of bacon in Rhodesia is not low, and the comparative figures given below should be of interest:—

United Kingdom	28 lbs. per annum
Canada	25 lbs. per annum
New-Zealand	15 lbs. per annum
Australia	12 lbs. per annum
Southern Rhodesia	12 lbs. per annum
Union of South Africa	5 lbs. per annum

From the figures given by the Government Statistician, the local consumption of bacon has apparently slightly decreased during the last four years, the *per capita* consumption and the price of bacon for the last four years being:—

	Per Capita consumption, lbs.	Average retail price (certain cuts). Salisbury.	Bulawayo.
1928	15	2/3d.	2/4½d.
1929	14	2/5d.	2/4½d.
1930	12	2/4d.	2/4d.
1931	11	1/9d.	1/11d.

(b) *The spread between the price on the hoof and the wholesale price of bacon.*—From the figures submitted to the committee, it appears that the manufacturing costs of bacon are appreciably higher in this Colony than at the larger factories in the Union or in the United Kingdom.

The comparatively high manufacturing costs in the Colony are, to a certain extent, explained by:—

1. Small turnover.
2. Wasty and unsuitable pigs.
3. Wastage of by-products.
4. Heavy trimming necessitated by fatty sides.
5. Spoilage in cure during the hot weather.
6. Bruised pigs in transit to the factory.
7. Lack of demand for shoulders and hams.

All these disadvantages are to be anticipated in a new country, but, despite this allowance, the committee was struck by the extremely low return of saleable product shown by the two factories, and consider that by stricter grading at the factory and more care in the "cure," it should be possible to raise the percentage of saleable product per pig very considerably.

Data from the two factories were obtained in regard to return of saleable product per pig. These are shown below:—

Bulawayo and Salisbury, 1931—

Average live weight of pigs	176 lbs.
Average weight recovered as—	
Bacon and hams	69.5 lbs.
Sausages	15.4 lbs.
Lard	10.4 lbs.
Total	95.3 lbs.
Average percentage of weight of pig recovered as saleable product ...	54.1%

These returns are low, and representative figures from the United Kingdom are given below for comparative purposes:—

Loss of Weight in Slaughter—

Live weight	180 lbs.
Less primary offal (liver, lungs, heart, entrails, average loss 23½%)	42.3 lbs.
Dressed carcase	137.7 lbs.
Less secondary offal (dressed carcase, head and tail, feet, backbone, tenderloin, pelvis bone, shoulder blade, kidneys, kidney fat, average loss 20%)	27.5 lbs.
Weight available for curing	110.2 lbs. = 61.2%
Smoked bacon	104 lbs. = 57.7%

(*Adapted from Economic Report No.* 17, *Ministry of Agriculture and Fisheries.*)

Assuming a 10 per cent. shrinkage, which the committee understands is considered a normal allowance for losses in curing and smoking in Rhodesia, the weight of bacon alone for a 180-lb. pig should be not less than 100 lbs. This figure exceeds the total product in the case of both factories.

The comparison is not perhaps altogether a fair one, as the figures quoted for the United Kingdom are for purely bacon types of pigs, but it illustrates the low return in bacon secured by the local factories and the possibility of improvement.

The loss of by-products is a serious one. In Denmark, it is estimated that the by-products represent 10 per cent. of the value of the pig. In the local factories the small turnover does not permit of an economic use of the by-products, and a serious loss results.

4. *The effect of the importation of bacon from the Union on the local market.*—Strong representations were made to the committee with reference to the "dumping" of bacon from the Union of South Africa.

In this connection the committee would point out that:—

(i.) The price of bacon in Bulawayo is actually higher than in Salisbury, which does not indicate "dumping."

(ii.) The Union bacon imported is, in the opinion of the Bulawayo distributors, on the whole, superior to the local article, and thus an influence towards the betterment of the local article.

(iii.) The Colony does not at present produce sufficient bacon for its own consumption.

At the time of the investigation the chief brand of imported Union bacon was selling wholesale in Bulawayo at 1s. per lb. for three-quarter sides. Statements made to the committee to the effect that Union bacon was on offer at 9½d. per lb. were definitely denied by the wholesale agent of the factory. He explained to the committee, however, that a low grade of belly bacon made by his firm was being sold by the piece at a lower price.

The price of 1s. per lb. is not considered an unreasonable one. From information received, it appears that similar bacon was selling in Johannesburg at 1s. per lb. at the time of this investigation. As the railage charge of 1d. per lb. has been borne by the exporter, and as the difference in exchange is met presumably by the exporter and the export subsidy in operation in the Union, the sale price of 1s. per lb. in Bulawayo does not appear to indicate serious dumping.

5. *The possibility for the development of an export trade in pig products.*—The local demand for bacon could be supplied by some 10,000 pigs per annum, which is only 2,000 to 3,000 more than the present supplies to the factories. It is clear, therefore, that no considerable development of the industry is possible while producers are entirely dependent on our local market. The development of an export trade is essential if the indnstry is to become of national importance. The export markets open to us are: Northern Rhodesia, the Congo, Mozambique Territory, Nyasaland, the Union of South Africa and the European market.

The Northern Rhodesia and the Congo markets are at present held by the Union factories almost entirely. The Mozambique requirements are supplied largely from Europe, and Beira merchants are of the opinion that Rhodesia would find it very difficult to compete in the best of circumstances.

The Union as a market for our supplies would depend on our being able to produce more cheaply than the Union factories. It is more than probable, however, that economic circumstances favourable to cheaper production in Rhodesia would apply with equal force in the Union, whose producers have hitherto been able to hold their own local market, and should be able to continue to do so.

Nyasaland is a small market.

At the present time, the export of pig products from the Colony is, moreover, handicapped by veterinary restrictions imposed by adjoining territories.

The greatest hardship imposed by these restrictions has been in connection with the export of live pigs to the North and South, which in 1930 amounted to 4,991 pigs, valued at £13,067, and of bacon and hams and fresh pork to Portuguese East Africa, which in 1930 amounted to 36,640 lbs., valued at £1,929.

It should be mentioned also that the manager of Neill's Factory considers that the Union would offer a valuable outlet for rolled shoulders, which are very difficult to dispose of in our local market.

Pig farmers in this Colony have therefore to look to the United Kingdom as the only secure outlet for their produce. In 1930 the United Kingdom imported over £40,000,000 worth of pig products. The inferior quality of our products and their comparatively high cost of production at present prevent this Colony from taking advantage of the English market.

The country is, however, well suited to the production of pigs on an economic basis. Satisfactory pigs, either for the bacon or the frozen pork trade, could be produced locally if the proper methods were followed, and the committee is satisfied that the industry in this Colony could be developed on lines similar to New Zealand and Australia, which of recent years have developed an important trade in frozen pork. The pig industry is, moreover, an essential sideline to the dairy industry, and an important consumer of maize.

The transition from a local to an export trade will not be easy.

The export parity of frozen pork—the most payable produce at present—is 3d. per lb. This figure is below the value of 3¾d. which local producers consider to represent the minimum cost of production, and until the average cost of raising pigs in the Colony is substantially reduced, no export is possible on economic lines.

In a general way it may be said that producers in this Colony are favourably situated in regard to the cost of the basic elements in production—feed, labour, capital. By scientific feeding and management, the two factors lacking at present, the committee believes that the cost of the bulk of the product could be brought down to-day to at least the 3½d. level. When this level is reached, export should become possible with the assistance of a comparatively small bounty, the need for which should disappear as the trade becomes organised and conditions overseas return to normal.

In the early stages the chief problem will be to obtain sufficient pigs to ensure the continuity of supply necessary to develop an export trade. The question of a bounty to finance export has been given much attention in the Union of South Africa. The opinion in the south appears to be crystallising on the necessity of a levy, comparable with the present levy on dairy products, to bridge the large immediate gap between local and export prices.

As the committee is of the opinion that some such system of bounty will be necessary to enable an export trade in pig products to be developed from this Colony, it would, therefore, urge that an early effort should be made to organise a Pig Producers' Association on lines similar to the one recently organised in the Union to bring pig farmers together and to create the sentiment necessary to bring a grading system into successful operation, and to make the imposition of a levy possible as soon as the necessity arises.

Three factories—the Rhodesia Export and Supply Company, the Farmers' Co-op., Salisbury, and Neill's Factory—were inspected to obtain a general idea of their suitability for the efficient handling of pigs for export. One of these, the Farmers' Co-op. Factory, Salisbury, is not working at present.

A reduction in the cost of manufacturing on the lines suggested in a previous section will be necessary at all these

factories to enable part of the burden of export to be taken from the shoulders of the producer, and as 20,000 pigs per annum is commonly considered to be the minimum output on which manufacturing costs can be reduced to competitive levels, a reduction in the present number of four factories in operation would be an advantage in the early stages of the industry.

The logical steps in the development of the industry are: —

(a) Improve the quality of the local pig and standardise the type as far as possible.

(b) Improve the method of feeding, particularly restricting the use of oil-bearing feeds.

To this end the committee would suggest that a copy of the Departmental pamphlets on pig breeding and feeding should be sent to every pig producer in the Colony, and that efforts should be made for an Animal Husbandry Officer to visit all pig producers as far as finances permit. There can be no doubt that the majority of producers do not give the attention to their pigs which is necessary to turn out the type of pig required overseas.

The committee, however, is convinced that no great improvement can be expected until greater encouragement than at present is given by the factories to the producer and feeder of the better type of pig. It feels that a strict system of grading is necessary to this end, with a significant difference in price for the better grades to encourage a producer to breed and feed on improved lines.

Producers are unanimous in regard to the necessity for an efficient grading system. The factories, while agreeing to the principle, appeared to be suspicious of Government interference, which the producers, on the other hand, considered essential.

The matter of grading seems to be the key to the position, and this committee would suggest that a meeting of curers and representatives of the producers should be held at an early date to discuss the possibility of developing a grading system in which both sides have confidence. If no agreement is possible, the committee feels that it may be

necessary to legislate for a grading system, to be supervised on the same lines as the present grading of cream.

The committee is not prepared to recommend an indiscriminate expansion of the industry at the present moment, but has no doubt that, if growth takes place along the proper lines, the future can be looked to with confidence.

SUMMARY.

(1) The local bacon is, on an average, not so good as the bacon imported from the Union of South Africa.

(2) The chief reason for this inferiority lies in the poor quality of the pigs.

(3) The distributors are making larger profits than are ordinarily considered reasonable in commercial circles.

(4) There is no serious "dumping" of Union bacon at present.

(5) Though conditions are suitable for pig-raising, this Colony is not yet in a position to develop an export trade in pig products to the United Kingdom.

An improvement in the quality of the pigs and a reduction in farm and factory costs of production are essential before an export trade could develop on economic lines.

(6) The lines of improvement suggested are:—

(a) Increased extension work.

(b) The introduction of a grading system.

(c) The organisation of a Pig Breeders' Association.

(d) The imposition of a levy to finance export.

A. E. ROMYN.
C. A. MURRAY.
E. R. JACKLIN.

FARMING CALENDAR.

July.

BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

CITRUS FRUITS.

The harvesting of mid-season oranges should be completed early in the month; late varieties should be fit to export by the middle of the month. The dead wood should be broken and cut out of all harvested trees; this will minimise mechanical injury occurring with next season's fruit. Trees that are to be fumigated should have the lower lateral branches that touch the soil removed. Trim the trees until all foliage is just clear of the ground. The irrigation of late varieties must be continued and the cultivators kept going. Mark all trees when in fruit if the quality is bad; these may be cut back in August for top working to a good quality fruit. The soil of the early and mid-season varieties may be allowed to become fairly dry, for irrigation of the harvested trees may start an out-of-season growth which will enable pests to flourish and increase for the main spring blossoming flush.

CROPS.

Support agricultural shows, and add to your list of exhibits. Advertise your goods through the shows. Interested people will see them. If you require to make purchases of seed for next season, judge by the exhibits on the show what grower can best supply your needs, and place your orders accordingly. Attend the shows and go there to learn all you can about your business, not merely to have a good time. Seed maize previously selected in the field should be butted and tipped and hand shelled. Keep the butt and tip grain for check-row planting by hand. Do not over-irrigate winter crops, and do not irrigate when the wind is from the south, as this often means frost at this time of year. Troublesome weeds, such as darnel grass or drabok, may be removed from cereal crops by hand. Ploughing should be pressed on with, and maize stalks and roots of maize and other trash from the crop should be collected and burned very thoroughly. A land littered with unburnt and unrotted stalks and roots cannot be brought to a suitable tilth for planting and subsequent cultivation. Silage and sweet potatoes and other succulent feeds will have come into general use now, the potatoes being lifted from the land as required. The application of phosphatic fertilisers which are to be ploughed or harrowed in can be begun. Take the opportunity, during this and the next month or two, of inspecting all boundary and paddock fencing and gates, and effect repairs where required. Give a coat of paint to implements, wagons and carts. This protects the woodwork from rotting and the iron from rust.

DAIRYING.

This is one of the coldest months of the year, and milk production as a rule is low. Those cows which are being milked should receive a full winter ration of succulents (ensilage, pumpkins or majordas), hay and concentrates. Milking cows should either be under shelter at night or kraals should be sheltered against cold winds. The old adage, "Shelter is as good as a meal," should be remembered throughout the winter months.

No difficulty should be experienced in producing first-grade cream at this time. In cold, windy weather due precautions should be taken to ensure that the milk when separated is not below 90 degrees.

Most cheese-makers cease their cheese-making operations at the end of the month, as the milk generally not only is scarce, but begins to be deficient in butter fat. Cheese in the store-room should be carefully watched, as cheese mite is likely to appear on old mature cheese. In order to prevent the undue drying out of the cheese, the floor of the cheese room should be sprayed with water from a watering can.

Butter-making is sometimes difficult because of the low temperature of the cream. The temperature should be raised by immersing the can in warm (not hot) water until churning temperature is attained.

DECIDUOUS FRUITS.

Pruning must be continued, and if possible completed this month. The planting of all varieties is best if done now. Add a liberal amount of water at planting time, then cultivate the basins. Sufficient moisture will be thus retained to keep the newly planted trees going until they start active growth. Repeat waterings when necessary. If trees arrive from the nurseryman in a dry and withered condition, immerse them in water for twelve or more hours until they regain turgidity; then plant. Running water is best. Keep cultivators going. It will be advisable to irrigate all trees towards the end of the month.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during July. Young louse-infested cabbage should be sprayed regularly with a forceful stream of water to dislodge the insects; or if this fails, spray with tobacco extract and soap. The Bagrada bug is difficult to control. Strong tobacco wash and soap, resin wash or an oil spray may be effective, especially against the younger stages. Daily hand picking is useful. Keep plants growing vigorously.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

Maize Beetle.—Infested lands to be thoroughly ploughed throughout the winter.

FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. The pruning of roses should be attended to early. Dahlias and other summer-flowering bulbs should be taken up, divided and replanted. Sweet peas require attention and staking.

VEGETABLE GARDEN.

Sow turnips, peas, cabbage, beet, carrots, parsnips, radishes, lettuce and spinach.

FORESTRY.

Care should be taken to protect all plantations from fire by hoeing or ploughing belts round them and burning any grass likely to be dangerous. Cuttings of various deciduous trees may be taken and struck in nurseries.

Continue pricking out conifers into tins or beds. In preparation for early planting in case the season is favourable, limited sowings of tree seeds may be carried out. If labour is available, preparation of land for planting to be taken in hand.

GENERAL.

Veld fires must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

POULTRY.

With the cold weather that we generally have in July, the birds should have extra food, i.e., barley or maize, if the supply of eggs is to be continued. A mixture of stewed linseed and bran should be given to the birds, warm, the last thing before they go to roost. This gives them a little extra food during the long and cold hours of the night at this time of the year and maintains the body heat. A certain amount of shelter is also necessary to protect them from the cold winds. Grass wind breaks about 3 feet high on the windward side of the rnn are sufficient. Remember that no chickens should be hatched after August; those hatched later take much longer to develop than those hatched before August, and they are usually stunted, weakly and unprofitable. Each month the young stock should be gone through and graded; anything that does not promise to be good should he got rid of. As the hatching season draws to a close, the breeding stock, if not carefully watched and treated, will become run down, and infertile eggs and weak chicks will be the result. Watch the breeding stock carefully and handle them occasionally; if they feel thin and light or the flesh is not hard but flabby, give extra food and more scratching exercise. The male especially should be well looked after and given a meal on three or four days of each week by himself; in addition, he should have some raw meat as often as possible. Good hatching and strong, healthy chicks are wanted right up to the end.

Turkeys should now be in full lay. Never disturb the hens when they are sitting. They are very sensitive and nervous, and unless left mainly to themselves, are apt to desert the eggs or break them. It is recommended that turkey chicks be reared by hand; the hens are poor mothers, they are clumsy, drag their chicks all over the place, and do not feed them as well as an ordinary hen does. The main thing is to keep the young turkeys warm, give them plenty of fresh air, thick separated milk and chopped onions or onion tops.

STOCK.

Cattle.—The bulls may again be put into the herd at the end of the month. Watch for any unthrifty cattle and get them into the home paddock and feed them before they become really poor. The value of a good provision for winter feed will be apparent now. Except under purely ranching conditions winter feeding should be general. Where areas have been properly reserved for winter grazing these should be *in use now*. The treatment of the dairy herd should be continued on the same lines as in June.

Sheep.—Vleis shonld now be fairly dry and may be utilised. There is, however, always the danger of internal parasites, and, where feed or grazing can be provided elsewhere, it is better to avoid vleis.

VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none is looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

August.

BEE-KEEPING.

This month is one of inaction as far as the apiarist is concerned and the hive inmates are best left alone, except that once a week a corner of the quilt on the top crate may he lifted to see if the wax moth has gained a footing, as it may do in a colony weakened by death from sundry causes, and in which case all such frames should at once be removed. Towards the end of the month, with warmer weather, the bees will be tempted out for play spells, cleansing flights, etc., and, according to the season, entrance stops may be opened out slightly with advantage.

In the workshop see that a spare hive or two are in readiness, well painted and ready for use at any hour; also have in readiness any requisite spares, and see that all appliances, such as veil, smoker, fuel, etc., are handy, for swarms may now go and come at a few minutes' notice. Where the bees have been left to their winter quarters with a fair supply of food, good results can confidently he looked forward to for the coming honey flow of the early winter weeks.

CITRUS FRUITS.

The first or spring growth should commence about the middle of the month, and the trees should have a good soaking of water when the new growth commences. If Washington Navel oranges are to set their main crop, frequent irrigations must take place from the time of blossoming up to the rainy season. These irrigations create the necessary humid conditions which are so essential to secure a satisfactory setting of this orange. It is advisable to stimulate the growth of unthrifty trees with an application of one to one and a half pounds of nitrate of soda when the first irrigation is given, this application of fertiliser to be followed by good cultivation. The amount of fertiliser recommended is for mature trees. The packing of late varieties will continue throughout the month. No bearing trees should suffer for want of moisture. Irrigation should not take place immediately before the harvesting of export fruit—at least ten days should elapse between irrigation and the harvesting. This is the best month to cut down citrus trees for re-working to better varieties. As the citrus trees are harvested, all dead, diseased and broken branches and shoots should be carefully cut out before the trees come into new growth.

CROPS.

If not already marketed, the main potato crop will probably be sold about now. Do not forget to grade the potatoes properly according to size. The buyer wants potatoes—table or seed—of even size, not large and small indiscriminately mixed. Select and clean farm-grown seeds ready for next season's planting. Label the bags with name and weight of contents.

Build a proper shed for your seed potatoes on the lines recommended in the *Rhodesia Agricultural Journal.* Sort over seed potatoes in store and remove any diseased or rotten. Green oat or barley fodder on wet vleis, or under irrigation, will become ready for cutting. Press on with ploughing and cross-ploughing. Decide what crops are to be grown next season, and, if you think fit, discuss the matter with officers of the Department of Agriculture. If you have not already effected all your purchases, consider the question of what seed you will require to buy for next season, and discuss the matter with other farmers. If in doubt, consnlt the Department of Agriculture. In frost-free situations, potatoes can be planted for an early crop under irrigation or on damp land. Cart and spread your farmyard manure and plough it under as soon as spread to avoid loss. If you have any long stable manure, apply it to your heaviest land. The application of phosphatic fertilisers to the land can continue. If you do not already have one, put up an implement shed, even if it be only poles and grass. Keep wagons and Scotch carts under a similar shed or in the shade of trees. Speed up the making and burning of bricks if this is still in progress.

DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. As a rule the weather is sufficiently cold to prevent cream, produced under average conditions, from undergoing rapid deterioration, and it is not usually necessary, therefore, to separate a cream of such high butter fat content as is required during the warmer months of the year. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. Cream can quite easily be cooled to churning temperature if placed outside the dairy and exposed to the atmosphere overnight. During cold weather, however, it is more frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

This is usually a critical time of the year for young dairy stock. For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

DECIDUOUS FRUITS.

All plantings of deciduous trees should be completed by now, as the late planting of these trees is generally unsatisfactory. Pruning may be continued up to the middle of the month. It is advisable to water or irrigate all deciduous trees before blossoming; if possible, a second irrigation should be given after the trees have set their fruit. Follow up the irrigations with good cultivation.

ENTOMOLOGICAL.

Potato.—Early planted crops of potatoes may be attacked by caterpillars. The crops should be sprayed immediately with arsenical wash such as lead arsenate powder, 1½ lbs. to 40 gallons of water.

Cabbage Family.—Young plants of this family should be kept sprayed with an arsenical wash to check attack by web-worms. The formula given

for potatoes with the addition of ½ to 1 lb. of spreader to every hundred gallons of spray should be effective. If cabbage louse is also present add tobacco extract, 1 part to 80 parts spray. Do not spray plants of which the foliage is to be eaten within three weeks.

Citrus Trees.—May be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine tobacco wash or Derris.

Guava.—Collect and destroy remnants of late crops to keep down citrus codling, especially if trees are in vicinity of citrus orchards.

FLOWER GARDEN.

Complete digging or forking over the soil as early as possible. Divide and replant dahlias, delphiniums, Shasta daisies, etc. Plant bulbs—tuberose, arum lilies and gladioli. Sow seeds of hardy annuals. Mulch newly-planted roses, shrubs, etc.

VEGETABLE GARDEN.

Plant out asparagus, cabbage, cauliflowers, onions and early potatoes. Sow seeds of tomato and other plants that are susceptible to frost in a sheltered position; also seeds of various vegetables and salads for summer use.

FORESTRY.

Cuttings of ornamental shrubs, roses, etc., struck in sand last month should be transplanted into good soil as soon as they show a good healthy growth of leaves. A large percentage of cuttings will damp off if left in sand longer than about six weeks. No manure should be added to the potting soil. Seed beds should be prepared and gum seeds sown if required for planting early in the season. If the trees are to be grown in seed beds only and not in tins, then gum seeds should not be sown until October, or later, as they will get too large.

GENERAL.

Fire guards should be completed and every precaution taken to guard against loss of grazing from fires. Natives commence ploughing their softer land this month, and for this reason, as well as because beer is plentiful at the kraals, local labour is apt to be scarce. At this time of the year, however, the need for boys on farms is not so severely felt as later on.

POULTRY.

By the end of this month all those who are not able to give much attention to the chicks while in the growing stage should have stopped hatching. Those who can give some extra care, can continue hatching for another month, but not later, for chicks hatched after August are usually slow in growth and weedy. They do not lay till some months after they should, and eggs are few in number; in fact, they are generally unprofitable.

Now that the hot weather is approaching, a constant war on insects must be carried out, and of these sand fleas and fowl ticks (erroneously called tampans) will be found to be the most troublesome. A bulletin on fowl ticks can be obtained upon application to the Poultry Expert, Department of Agriculture. Sand fleas, as most poultry keepers know, are found on the face, wattles, ear-lobes and combs of the birds. Application of carbolised vaseline will usually kill them at once, or two or three applications of any ordinary grease on successive days are efficacious. More than this is, however, necessary, for the breeding quarters of these insects (and they multiply very rapidly) are in the dust on the floor of the house and that of the run.

The best preventive is a hard floor (preferably of concrete) with no cracks. If this is not possible, the floor and around the house should

be treated every week in one of the following ways:—(1) Thorough soaking with a solution of one teacupful of Kerol, Jeyes, Hycol, Izal, or similar disinfectant to a paraffin tin of water, or (2) with a strong solution of salt and water, or (3) dusting over and raking into the soil a mixture of one part flowers of sulphur and two parts finely powdered lime.

Ducks.—See that the breeding ducks have plenty of water, and if possible also some to swim in. Keep young ducklings out of the hot sun, otherwise there will be many deaths. The same applies to geese and goslings.

Turkeys.—Young turkeys must be protected from cold at night, for this is fatal to them. Give them as much free range as possible, and do not allow them to run round the house or on the same ground as fowls do. Turkeys like clean ground; any that is tainted is very detrimental to them. Let them find most of their food in the bush.

STOCK.

Cattle.—On the early granite and sand veld probably the worst of winter is over so far as grazing is concerned, and a nice bite of green grass is appearing. Care should be taken where cattle are allowed to graze on the early burnt grass not to let them get too much at first. On red soil farms the haystack will still be required, and in all cases a certain amount of hay or ensilage should be held in reserve against the possibility of very late rains. In dairy herds on any soils whatever, feeding, housing and bedding should not be relaxed. A satisfactory ration for a medium producing cow in full milk is 5 lbs. of maize, 30 to 40 lbs. of ensilage or pumpkin and 8 to 10 lbs. of hay. If it is possible to give, in addition to the above daily ration, 2 lbs. of gronnd nuts, crushed with the shell, or oil cake, a very great benefit will be derived. Full particulars of the rationing of dairy cows can be obtained on application to the Department of Agriculture. Calves, especially young ones, must be carefully watched; they should not run too far, and are better inside, except when the weather is warm. They should be fed a little sweet hay, bean meal, linseed, ground nuts or ground nut cake and a small ration of green food.

Sheep.—Sheep should give little trouble at this time of the year. In many places now they will be grazing on the early "burns." The ewes and lambs should be given the best grazing available.

TOBACCO.

The seed bed site should be cleared and well ploughed, preparatory to burning and sowing. The usual date of sowing the first beds is the 15th September. Bulletins covering every phase of tobacco culture can be had upon application to the Editor.

VETERINARY.

Redwater and gall-sickness occur all the year round, although these diseases are more prevalent during the summer months. A good many deaths occur this month, however, amongst imported stock. Vegetable poisoning will probably be in evidence. Sheep can be inoculated against blue tongue. Scab is a poverty winter disease.

WEATHER.

No rain is to be expected, and even on our eastern mountains the precipitation is trifling. Showers, however, do occasionally fall in places, but are of no consequence. The sun is often warm during the day, but the nights are apt to be cold, and grazing being scarce, food and shelter are necessary for the stock.

SOUTHERN RHODESIA VETERINARY REPORT.

April, 1932.

AFRICAN COAST FEVER.

MELSETTER DISTRICT.

Roede Farm.—No deaths. The cattle were temperatured and removed to Welgelegen Farm. Several animals showing a rise in temperature were destroyed, but smears from these showed no evidence of the disease.

Rocklands Estate.—The mortality to the end of April was: Constantia, 101; Clifton, 7. This outbreak is attributed to an exchange of cattle from Tilbury Estate in 1931. After the discovery of the Tilbury outbreak, these cattle were temperatured without disclosing any signs of the disease, but previous to this three oxen had died, two of which were from gall sickness, but the carcase of the third was found putrid, and the death may have been caused by Coast Fever.

The Constantia and Clifton herds are being isolated and dipped separately from the other herds on the estate.

Sawerombi.—Four cases were diagnosed on this farm in cattle previously moved from Rocklands Estate.

Melsetter Commonage.—No further cases.

Springvale.—The remainder of the herd on this farm were slaughtered.

FOOT AND MOUTH DISEASE.

GWELO VETERINARY AREA.

Selukwe District.—The disease extended to the farms Umlangana and Dorset, adjoining the infected farm Adamantia; later, the cattle on Aberfoyle Block were found to be

infected; these are being inoculated with the cattle on adjoining farms, which are being dipped together.

UMVUMA VETERINARY AREA.

Chilimanzi District.—Infection is spreading very slowly within the Central Estates and is very mild in character. The farms Smithvale and Makanya, also the Chilimanzi Reserve, are now clean.

Charter District.—The farms Opal and Versailles are now clean, and no active centre exists in this district.

VICTORIA VETERINARY AREA.

Victoria District.—The disease has not spread, and the only infected areas now existing are the Mtilikwe and Nyadjena Reserves and the eastern sections of the Nuanetsi Ranch in this district.

BULAWAYO VETERINARY AREA.

Belingwe District.—The farms Grimstone, Dumbarton and Lukotsi became infected, and all the cattle from these and the *adjoining farms, numbering over four thousand* head, were removed into the Belingwe Reserve to be inoculated. The infection also appeared in Liebig's Wedza Block, Sub-Camp VII., which had not been previously infected.

Insiza District.—Infection appeared on the farm Indhlela, and the cattle on this and the two farms on either side were removed south into the Belingwe Reserve for the purpose of inoculating them.

TRYPANOSOMIASIS.

Nineteen cases were diagnosed on the Eastern Border, Melsetter district, and twelve in the Bubye district.

HORSE-SICKNESS.

The *following* deaths *were reported*:—Lomagundi 1, Bubye 1, Inyati 1, Insiza 2, Bulawayo 3, Plumtree 6, Gwelo 1, Chilimanzi 1, Victoria 2.

MYIASIS (SCREW WORM IN CATTLE).

This has been very prevalent.

IMPORTATIONS.

From the Union of South Africa: Bulls 2, heifers 9, horses 8, sheep 1,553, goats 227, pigs 24.

EXPORTATIONS.

Nil.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

SOUTHERN RHODESIA WEATHER BUREAU.

MAY, 1932.

Pressure.—The barometric pressure was generally considerably above normal. A remarkably deep low passed along the south coast on the 24th, 25th and 26th of the month; it did not move up the coast, and conditions were only affected very slightly in Southern Rhodesia.

Temperature.—Owing to the prevalence of cloud the maximum temperatures were low and the minimum temperatures high; on the mean, the month was cool. Frost was almost completely absent.

Rainfall.—Slight rains were recorded at most stations.

MAY, 1932.

Station.	Pressure Millibars, 8.30 a.m. Mean.	Pressure Millibars, 8.30 a.m. Normal.	Temperature in Stevenson Screen ° F. Absolute. Max.	Absolute. Min.	Mean. Max.	Mean. Min.	Mean. ½ Max. Min.	Mean. Normal.	Mean. Dry Bulb.	Mean. Wet Bulb.	Rel. Hum. %	Dew Point F.	Cloud Amt. 0-10	Precipitation. Ins.	Precipitation. Normal.	Precipitation. No. of Days.	Altitude (Feet).
Bulawayo ...	873.4	871.5	79	45	70.0	49.8	59.9	61.1	59.1	52.7	65	48	5.4	0.32	0.4	6	4,436
Gwelo	866.9	...	78	41	69.2	48.3	58.8	60.8	58.6	51.7	63	46	5.2	0.10	0.3	1	4,632
Riverbank ...	...	...	86	44	75.8	49.7	62.8	62.6	59.5	53.5	67	48	...	0.08	0.7	3	4,100
Essexvale ...	...	...	90	42	76.5	49.2	62.9	62.0	54.3	51.6	83	49	..	0.71	0.5	6	3,828
Gwanda ...	912.0	...	83	40	72.8	51.1	61.9	...	61.4	55.4	68	51	4.4	0.75	0.3	5	3,235
Mazunga ...	954.4	952.6	91	42	80.4	52.8	66.6	65.7	65.0	58.4	67	54	4.9	0.54	0.5	5	1,970
Nuanetsi ...	...	...	90	43	82.9	52.0	67.5	..	62.0	57.6	76	54	5.0	0.32	0.4	7	1,630
Between Rivers	...	...	86	41	77.1	48.2	62.7	...	58.5	54.6	78	52	3.1	0.28	0.1	6	3,970
Enkeldoorn ...	...	...	78	44	69.0	48.6	58.8	60.9	58.8	53.4	70	49	4.5	0.35	0.3	6	4,720
Gatooma ...	...	...	83	43	75.5	48.7	62.1	64.2	62.4	55.9	66	51	3.8	0.10	0.3	2	3,850
Miami	...	...	80	45	73.2	52.3	62.8	...	62.4	56.6	70	53	3.7	...	...	...	4,090
Salisbury ...	859.1	858.1	80	43	71.9	49.4	60.7	61.0	60.4	54.0	66	49	4.0	0.39	0.3	3	4,890
Sinoia, Citrus ...	...	...	83	43	76.7	50.1	63.4	...	60.6	55.9	75	53	...	...	0.4	...	3,830
Sipolilo... ...	...	...	82	44	73.3	53.1	63.2	...	63.5	56.8	66	52	2.6	0.41	0.5	3	3,900
Mtoko	...	...	78	49	72.1	52.6	62.4	...	61.5	56.3	72	52	2.8	0.33	0.4	1	4,210
Shamva ...	...	...	84	45	77.3	51.0	64.2	...	63.7	58.3	72	55	2.6	0.20	0.4	1	3,170
Angus Ranch ...	...	...	85	50	76.0	55.7	65.9	65.4	61.8	57.9	79	55	...	0.51	0.2	7	2,300
Craigendoran ...	...	...	83	44	75.3	52.2	63.8	...	63.9	58.7	73	55	...	0.08	0.4	3	3,430
New Year's Gift	...	...	83	50	74.3	53.7	64.0	...	60.7	57.0	80	54	...	0.81	0.5	7	2,700
Nyamasanga ...	...	...	77	44	68.9	48.1	58.5	...	60.2	54.1	67	50	...	0.97	...	7	5,080
Riverdene North	...	...	84	37	73.2	45.6	59.4	...	55.4	53.1	86	51	...	0.84	0.4	9	3,700
Stapleford ...	...	...	70	35	61.8	44.5	53.2	...	55.6	52.3	80	49	4.6	1.18	1.3	11	5,450
Umtali	898.0	895.7	81	46	70.5	52.2	61.4	62.6	61.7	57.6	78	54	5.0	0.85	0.5	8	3,677
Victoria ...	901.6	899.3	80	41	70.5	48.0	59.3	59.9	58.5	54.8	80	53	4.8	0.81	0.4	9	3,570
Melsetter ...	854.6	...	74	45	65.4	49.5	57.5	...	58.2	53.6	74	50	3.7	3.25	1.0	8	5,060
Mount Selinda	...	...	77	48	67.5	52.2	59.9	...	58.2	55.9	87	54	4.1	3.12	1.6	8	3,520
Manchester ...	...	...	72	41	64.0	47.8	55.9	...	51.2	50.0	92	49	...	0.73	...	8	...

DEPARTMENTAL BULLETINS.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution at 3d. per copy. Application should be made to the Editor, Department of Agriculture, Salisbury, and remittances must accompany orders.

AGRICULTURE AND CROPS.

No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.

No. 374. Fibre Crops—Deccan Hemp (Hibiscus Cannabinus) and Sunn Hemp (Crotolaria Juncea), by J. A. T. Walters, B.A.

No. 429. Propagation of Kudzu Vine, by H. C. Arnold.

No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.

No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.

No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.

No. 550. Onion Growing under Irrigation, by C. Mainwaring.

No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.

No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E, B.Sc., F.I.C.

No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.

No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.

No. 630. The Storage of Seed Potatoes, by H. C. Arnold.

No. 634. Barley, by P. V. Samuels.

No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.

No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.

No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.

No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.

No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.

No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.

No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.

No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance" during the year 1927-28.

No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.

No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.

No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).

No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.

No. 713. *Ensilage, by J. A. T. Walters, B.A., Agriculturist.*

No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.

No. 732. Two Common Diseases of Potato Tubers in Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.

No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.

No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.

No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.

No. 759. Witch Weed (Striga Lutea): Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.

No. 768. The Ground Nut (Arachis hypogaea), by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.

No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.

No. 781. Agricultural Costings at the Gwebi Farm—Maize and Green Manuring, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.

No. 787. Agricultural Costings at the Gwebi Farm—Ground Nuts and Maize and Beans for Silage, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

No. 793. Agricultural Costings on the Gwebi Farm, by H. G. Mundy, Dip.Agric., Chief Agriculturist.

No. 797. Green Manuring: An Essential Practice in Rhodesian Farming, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

No. 802. Witch Weed, by S. D. Timson, M.C., Inter.B.Sc. (Agric.) Lond., Dip.Agric. (Wye), Assistant Agriculturist.

No. 807. Studies on the Improvement of Natural Veld Pastures: No. 2, by A. D. Husband, F.I.C., and A. P. Taylor, M.A., B.Sc., Chemistry Branch, Department of Agriculture.

No. 813. A Preliminary Note on Clovers in Southern Rhodesia, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.

No. 815. New Strains of Oats for Southern Rhodesia, by H. C. Arnold, Manager, Agricultural Experiment Station, Salisbury.

No. 816. Preliminary List of the more Common Grasses of Southern Rhodesia, by Sydney M. Stent, Botanist for Pasture Research.

No. 820. The Great Economic Problem in Agriculture—No. 1, by J. R. McLoughlin, M.Sc. (Economics), Economic Adviser.

No. 822. Re-stacking of Maize rejected for Export on account of *Excessive Moisture.*

No. 823. The Law of Supply and Demand—No. 2, by J. R. McLoughlin, M.Sc. (Economics), Economic Adviser.

No. 826. Some Poisonous Plants of Southern Rhodesia, by Sydney M. Stent, Senior Botanist.

No. 831. Revised Notes on Cotton Growing in Southern Rhodesia, by G. S. Cameron.

No. 833. Subterreanean Clover on the Sand Veld as Feed for Poultry in the Winter, by S. D. Timson, M.C., Dip.Agric.(Wye).

No. 836. The Potato, by S. D. Timson, M.C., Dip.Agric.(Wye).

No. 837. Veld Grass Silage—A Feature in Rhodesian Pasture Management, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief, Division of Plant Industry.

No. 838. Witch Weed—Progress Report and a Warning, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.

No. 841. Poisonous or Suspected Poisonous Plants of Southern Rhodesia: Tulp Poisoning of Cattle, by Sydney M. Stent, Senior Botanist, and D. A. Lawrence, B.V.Sc., Veterinary Research Officer.

No. 855. Pigeon-hole Method of Stacking Maize, by Division of Plant Industry.

REPORTS ON CROP EXPERIMENTS.

No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.

No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.

No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.

No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.

No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.

No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.

No. 773. Bulawayo Municipal Demonstration Station: Report for the Seasons 1927-28 and 1928-29, by D. E. McLoughlin, Assistant Agriculturist

No. 789. Agricultural Experiment Station, Salisbury: Annual Report of Experiments, 1928-29, by H. C. Arnold, Manager.

No. 800. Bulawayo Municipal Experiment Station: Report for the Season 1929-30, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.

No. 806. Gwebi Demonstration Farm, by the Chief Agriculturist.

No. 810. Gwelo Municipal Demonstration Station: Annual Report, 1929-30, by S. D. Timson, M.C., Inter.B.Sc. (Agric.) Lond., Dip.Agric. (Wye), Assistant Agriculturist.

No. 830. Salisbury Agricultural Experiment Station, Annual Report, 1929-30, by H. C. Arnold, Manager.

No. 842. Gwelo Municipal Demonstration Station: Annual Report, 1930-31, by D. E. McLoughlin, Assistant Agriculturist.

No. 851. Bulawayo Municipal Demonstration Station: Final Report, 1932, by D. E. McLaughlin, Assistant Agriculturist.

TOBACCO.

No. 605. Flue-curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.

No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.

No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.

No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.

No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).

No. 661. Flue-curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.

No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.

No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.

No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.

No. 728. Suggested Crop Rotations for Tobacco Growers, by D. D. Brown, Chief Tobacco Expert.

No. 734. Common Faults in Curing Virginia Bright Tobacco, by D. D. Brown, Tobacco and Cotton Expert.

No. 746. The Development of the Tobacco Industry in Southern Rhodesia. A Historical Survey, by D. D. Brown, Chief Tobacco Expert.

No. 748. Frog Eye Disease of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 753. Leaf Spotting of Tobacco caused by Mosaic, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 771. Dark Fire-cured Tobacco: Field Operations, by D. D. Brown, Chief Tobacco Expert.

No. 774. Dark Fire-cured Tobacco: Harvesting and Curing, by D. D. Brown, Chief Tobacco Expert.

No. 784. Field Control of Frenching in Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist.

No. 812. Selection of Tobacco Seed Plants, by H. F. Ellis, M.Sc., B.Sc. (Agr.), Tobacco Adviser.

No. 828. Seed-Beds, by D. D. Brown, Chief Tobacco and Cotton Expert.

No. 835. Tobacco Culture—Transplanting Operations, by D. D. Brown.

No. 839. Tobacco Experiment Station, Salisbury—Report of General Crop Experiments, by C. A. Kelsey Harvey, Manager.

No. 840. Curing Tobacco by the Leaf Method *v.* Curing on the Stalk, by W. Collingwood-Evans, B.Sc. (Agr.).

No. 846. Leaf Curl in Tobacco, by Dr. H. H. Storey.

No. 850. Pests of Stored Tobacco in Southern Rhodesia, by M. C. Mossop, M.Sc., Entomologist.

Handbook of Tobacco Diseases in Southern Rhodesia, by J. C. F. Hopkins, B.Sc., A.I.C.T.A. Price 3/6 post free from Accountant, Department of Agriculture, Salisbury.

LIVE STOCK.

No. 338. From Breeder to Butcher; Beef Experiment No 5, by E. A. Nobbs, Ph.D., B.Sc.

No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.

No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.

No. 483. From Breeder to Butcher; Cattle Feeding Experiments Nos. 14 and 15, Government Experiment Farm, Gwebi, by Eric A. Nobbs. Ph.D.. B.Sc.

No. 624. The Construction of Dipping Tanks for Cattle (Revised).

No. 701. Feeding Bullocks at Gwebi, by S. D. Timson, M.C., Dip.Agric.

No. 719. Hand-rearing of Calves (Revised), by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 720. Fattening for Beef at the Gwebi Farm, by H. G. Mundy, Chief Agriculturist, and T. J. Needham, Accountant, Agricultural and Veterinary Departments.

No. 737. Fur and Wool-producing Rabbits, by Captain Edgar S. Everett, Hovere Farm, Banket.

No. 749. Dehorn your Commercial Cattle, by W. Fleming, Stock Adviser.

No. 755. Iodine in Animal Nutrition, by J. Park Hamilton, District Veterinary Surgeon, Gwelo.

No. 801. Sheep Farming in the Melsetter District, by J. C. Kruger, Part-time Sheep Adviser in the Melsetter District.

No. 845. The Raising of Bacon Pigs, by Dr. A. E. Romyn, Senior Animal Husbandry Officer; C. A. Murray, Lecturer in Animal Husbandry, Matopos School of Agriculture, and D. A. Lawrence, Veterinary Research Officer.

Arsenite Cattle Dip—How to Mix.

DAIRYING.

No. 520. Treatment of Gassy Curds in Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D.

No. 530. The Dairy Industry: Causes of Variation in Cream Tests, by T. Hamilton, M.A., N.D.A., N.D.D.

No. 577. Cream Cheese, by J. R. Corry, B.Sc. (Agr.).

No. 594. Milk Recording and its Advantages, by T. Hamilton, M.A., N.D.A., N.D.D. Introduction by J. R. Corry, B.Sc.

No. 667. Farm Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 703. Dairy Buildings in Southern Rhodesia: Cow Byre—Type II., by B. G. Gundry, Irrigation Branch.

No. 711. Dairy Buildings in Southern Rhodesia. A Small Farm Dairy, by B. G. Gundry, A.I.Mech.E.

No. 717. Gouda or Sweet Milk Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 730. Common Defects in Butter-making, by T. Hamilton, M.A., N.D.A., N.D.D., and J. R. Corry, B.Sc. (Agr.), Dairy Experts.

No. 785. Bacon Curing on the Farm, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 792. The Feeding of Dairy Stock in Southern Rhodesia, by T. Hamilton, M.A., N.D.A., N.D.D., and J. R. Corry, B.Sc. (Agr.), Dairy Experts.

No. 799. The Objects of Ripening Cream for Butter-Making, and a few Hints on Cream Production, by F. Lammas, Dairy Officer.

No. 818. Farm Butter-making—Issued by the Dairy Branch.

No. 844. Southern Rhodesia Milk Recording Scheme.

Points to be observed in Cream Production.

VETERINARY.

No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.

No. 536. Inoculation of Cattle against Redwater and Gall Sickness, by Ll. E. W. Bevan, M.R.C.V.S.

No. 570. The Spaying of Bovines, by G. C. Hooper Sharpe, M.C., M.R.C.V.S., and M. H. Kingcome, M.R.C.V.S.

No. 597. Suspected Poisoning of Stock: The Proper Procedure, by M. H. Kingcome, M.R.C.V.S. (Lond.), and A. W. Facer, B.A. (Oxon.), A.I.C.

No. 618. Notes from the Veterinary Laboratory: Quarter Evil, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

No. 642. The Laboratory Diagnosis of Animal Diseases, by Ll. E. W. Bevan, M.R.C.V.S.

No. 666. Notes from the Veterinary Laboratory: Præmonitus—Præmunitus, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

No. 678. Cattle Transport Areas.

No. 739. The Laboratory Diagnosis of Animal Diseases: A Note to Emphasise some Points in the Preparation and Forwarding of Specimens, by D. A. Lawrence, B.V.Sc., Veterinary Research Officer.

No. 756. Parasitic Gastritis of Cattle, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

No. 760. A Note on Sheep Diseases in Southern Rhodesia, by D. A. Lawrence, B.V.Sc., Veterinary Research Officer, Department of Agriculture, Salisbury.

No. 772. Notes from the Veterinary Laboratory: Ophthalmia, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

No. 819. Measles in Swine, by P. D. Huston, M.R.C.V.S.

Services of Government Veterinary Surgeons.

The Campaign against African Coast Fever, by Ll. E. W. Bevan, M.R.C.V.S.

Parasitic Gastritis of Cattle, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

IRRIGATION.

No. 384. The Application of Water in Irrigation, by A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.

No. 412. Water Power Resources of Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 529. The Umtali River Irrigation Scheme, by C. P. Robinson, B.Sc.

No. 632. Domestic Water Supplies and Sanitation on the Farm, by P. H. Haviland, B.Sc. (Eng.).

No. 633. The Cost of Pumping for Irrigation, by R. H. Roberts, B.Sc. (Eng.).

No. 640. Levelling for Irrigation, by Dr. W. S. H. Cleghorne, M.I.Mech.E.

No. 659. The Hydraulic Ram, revised by P. H. Haviland, B.Sc.

No. 660. Small Earthen Storage Reservoirs, by C. L. Robertson, B.Sc.

No. 668. The Water Act, 1927, by C. L. Robertson, B.Sc. (Eng.), A.M.I.C.E.

No. 670. Irrigation Canals, by P. H. Haviland, B.Sc. (Eng.).

No. 735. Soil Erosion, by P. H. Haviland, B.Sc. (Eng.), A.M.I.C.E., Assistant Irrigation Engineer.

No. 766. Conditions Governing the Hire of Government Boring Machines.

No. 780. Short Specifications for Reinforced Brick Tanks up to 20,000 Gallons Capacity, by R. Hamilton Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

No. 782. Reinforced Concrete Water Tanks, by R. Hamilton Roberts, B.Sc. (Eng.).

No. 786. Low Concrete Dams, by R. Hamilton Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

No. 808. The Application of Water in Irrigation, by R. Hamilton Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

No. 811. Irrigation Canal Structures, by R. H. Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

FORESTRY.

No. 555. Forestry in the Melsetter District, by J. S. Henkel.

No. 575. Tending of Eucalyptus Plantations, by A. S. Thornewill, B.A.

No. 722. Rules for Tree-planting, by T. L. Wilkinson, M.Sc., B.Sc.F.

No. 744. Farm Forest Practice in Southern Rhodesia; Part IV. Tending and Care of Young Plantations. Issued by the Forest Service.

No. 763. The Utilisation of Wood, by T. L. Wilkinson, M.Sc., B.Sc.F.

No. 769. The Utilisation of Wood, by T. L. Wilkinson, M.Sc., B.Sc.F.

No. 778. The Utilisation of Wood in Southern Rhodesia—Conversion and Disposal of Timber, by T. L. Wilkinson, M.Sc., B.Sc.F., District Forest Officer.

No. 791. The Utilisation of Wood in Southern Rhodesia: Fencing, by T. L. Wilkinson, M.Sc., B.Sc.F., District Forest Officer.

No. 809. Establishing Pines: Preliminary Observations on the Effects of Soil Inoculation. Issued by the Division of Forestry.

No. 817. The Raising of Forest Seedlings and Transplants on the Farm, by E. J. Kelly Edwards, M.A., Dip.For. (Oxon.), Acting Chief Forest Officer.

Price List of Forest Tree Transplants, Ornamental Trees and Shrubs, Hedge Plants, Creepers and Seeds.

HORTICULTURE.

No. 471. Budding of Citrus Trees, by A. G. Turner.

No. 637. Harvesting, Packing and Marketing of Deciduous and Tropical Fruits, by G. W. Marshall, Horticulturist.

No. 669. Citrus Fruit Growing in Rhodesia, by G. W. Marshall, Horticulturist.

No. 725. Investigations into "Collar-Rot" Disease of Citrus, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).

No. 741. Fruit Growing in Southern Rhodesia: The Home Orchard, by G. W. Marshall, Horticulturist.

No. 805. Making a Garden in Rhodesia: Hints for Beginners and New-comers, by Mrs. E. M. V. Carnegie.

No. 814. Avocado Growing in South Africa, by Redvers J. Blatt, B.Sc., Ph.D.

No. 821. Vegetable Growing in Southern Rhodesia—Lettuce, by G. W. Marshall, Horticulturist.

No. 824. Vegetable Growing in Southern Rhodesia—Tomato Culture, by G. W. Marshall, Horticulturist.

No. 829. Asparagus Culture, by G. W. Marshall, Horticulturist.

No. 834. Celery Culture, by G. W. Marshall.

No. 843. Vegetable Growing in Southern Rhodesia: Onion Culture, by G. W. Marshall, Horticulturist.

A Comparative Study of the Citrus Industry of South Africa, by Herbert J. Webber, Ph.D., D.Agr. Price 2s.

ENTOMOLOGY AND PLANT PATHOLOGY.

No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R. W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 369. The Bean Stem Weevil, a Minor Pest of Beans, by Rupert W Jack, F.E.S.
No. 385. The Common Fruit Beetle, by R. W. Jack, F.E.S.
No. 425. Notes from the Entomological Branch, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 450. Insect Pests of Fruits other than Citrus in Southern Rhodesia, by R. W. Jack, F.E.S.
No. 476. Tsetse Fly—Inspection of Shangani Experimental Area, by Rupert W. Jack, F.E.S.
No. 503. Locusts, by J. K. Chorley.
No. 516. The Coming Campaign against Locusts, by Rupert W. Jack, F.E.S.
No. 522. Notes on the Black Citrus Aphis, by C. B. Symes.
No. 548. Insect Pests of Cotton, by C. B. Symes.
No. 553. Observations on Some Injurious Markings of Oranges, by C. B. Symes.
No. 587. Tsetse Fly in the Lomagundi District, by R. W. Jack, F.E.S.
No. 593. Notes from the Entomological Laboratory—(1) Outbreak of Army Worm (*Laphygma exempta*, Wlk.), (2) Cattle Myiasis: "Screw Worm," by Rupert W. Jack, F.E.S.
No. 602. *Preliminary List of Plant Diseases Recorded in Southern* Rhodesia, by F. Eyles.
No. 613. Two Diseases of the Vine, by F. Eyles, Mycologist.
No. 639. Diseased Plants for Examination: Collecting and Despatching the Material, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc., (Lond.), A.I.C.T.A. (Trinidad).
No. 654. Root Gallworm or Root Knot Eelworm (*Heterodera radicicola*, Greef), by Rupert W. Jack, F.E.S.
No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 673. Bats, by J. Isgaer Roberts, B.Sc.
No. 696. Ticks Infesting Domestic Animals in Southern Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 714. Trap Cropping against Maize Pests, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 732. Two Common Diseases of Potato Tubers in Rhodesia, by J. C. F. Hopkins, B.Sc. (London), A.I.C.T.A.

No. 742. What is Diplodia in Maize? An Answer to a Popular Question To-day, by J. C. F. Hopkins, B.Sc. (London), A.I.C.T.A., Chief Botanist and Mycologist.

No. 747. Mycological Notes: (1) Seed Treatment for Maize against Diplodia; (2) Seed Treatment for Tobacco against Bacterial Diseases. Issued by authority of the Minister of Agriculture and Lands.

No. 748. Frog Eye Disease of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 753. Leaf Spotting of Tobacco caused by Mosaic, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 754. "Pinking" of Maize—Report of a Preliminary Investigation, by T. K. Sansom, B.Sc., Plant Breeder.

No. 784. Field Control of Frenching in Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist.

No. 788. A List of Plant Diseases Occurring in Southern Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist.

A List of Plant Diseases Occurring in Southern Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist. Supplement No. 1.

No. 790. Notes on the Control of Some of the More Important Insect Pests of Citrus in Southern Rhodesia, by W. J. Hall, Ph.D., B.Sc., Entomologist to the British South Africa Company in Southern Rhodesia.

No. 796. The Army Worm (Laphygma Exempta, Wlk.), by Rupert W. Jack, Chief Entomologist.

No. 798. The Preparation of Bordeaux Mixture and Seasonal Notes on Tobacco Diseases, by J. C. F. Hopkins, B.Sc. (London), A.I.C.T.A.

No. 804. Locusts in Southern Rhodesia, by Rupert W. Jack, Chief Entomologist.

No. 825. Some Common Diseases of Potatoes in Southern Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Government Plant Pathologist.

No. 847. The Lesser Tobacco Wireworms, by Rupert W. Jack, Chief Entomologist.

No. 848. Mycological Notes: Seasonal Notes on Tobacco Diseases—3, Frog Eye; 4, White Mould; by J. C. F. Hopkins, B.Sc., London.

No. 856. A List of Plant Diseases occurring in Southern Rhodesia, Supplement 2, by J. C. F. Hopkins, B.Sc. (Lond.), Government Plant Pathologist.

POULTRY.

No. 622. Ducks on the Farm, by H. G. Wheeldon.

No. 635. Ovarian Troubles, by A. Little.

No. 638. Poultry Parasites, by A. Little.

No. 662. Poultry Husbandry: Temperament, by A. Little, Poultry Expert.

No. 721. Poultry Keeping in Rhodesia: Pedigree Breeding, by H. G. Wheeldon, Assistant Poultry Expert.

No. 731. Scarcity of Eggs: Causes and Remedies, by A. Little, Poultry Expert.

No. 738. Hints to Breeders—Rearing Young Stock, by A. Little, Poultry Expert.

No. 740. Artificial Incubation, Brooding and Rearing of Chickens, by H. G. Wheeldon, Poultry Expert.

No. 761. Housing and Feeding of Adult Stock, by H. G. Wheeldon, Poultry Expert.

No. 795. The Turkey, by G. H. Cooper, Assistant Poultry Officer.

No. 803. Geese, by G. H. Cooper, Assistant Poultry Officer.

No. 827. The Ideal Brooder, by F. Roberts, Assistant Poultry Officer.

The following pamphlets can be obtained from the Poultry Expert upon application :—

Selecting Birds for Laying Tests, by A. Little, Poultry Expert.
Cold Weather: Treatment of Fowls in, by A. Little, Poultry Expert.
Tuberculosis, by A. Little, Poultry Expert.
Diseases of the Liver, by A. Little, Poultry Expert.
Prevention of Disease among Poultry, by A. Little, Poultry Expert.
Vices: Causes, Prevention and Cure, by A. Little, Poultry Expert.
Chicken-pox (Warts), by A. Little, Poultry Expert.
Autopsies, by A. Little, Poultry Expert.
Autopsies (continued), by A. Little, Poultry Expert.
Preparing Birds for Show, by A. Little, Poultry Expert.
Coccidiosis, or Entero-Hepatitis, by A. Little, Poultry Expert.
The Fowl Tick (*Argas persicus*), by A. Little, Poultry Expert.
Worms (Autopsies—continued), by A. Little, Poultry Expert.
Culling: A Seasonal Operation, by A. Little, Poultry Expert.
Choosing a Male Bird, by A. Little, Poultry Expert.
The Breeding Stock, by A. Little, Poultry Expert.
Diseases of the Digestive System, by A. Little, Poultry Expert.
Bone and Breast Bone, by A. Little, Poultry Expert.
Mating for Improvement and Increased Egg Production, by A. Little, Poultry Expert.
Partial Moult: Broodiness: Selection of Layers of Large Eggs, by A. Little, Poultry Expert.
Sunflower as a Food, by A. Little, Poultry Expert.
Grow Sunflowers, by A. Little, Poultry Expert.
Exhibiting Eggs at Shows, by A. Little, Poultry Expert.
Condition of Birds on Show, by A. Little, Poultry Expert.
Green Food: The Result of not Supplying Sufficient to Poultry, by A. Little, Poultry Expert.
Good and Bad Hatching Eggs, by A. Little, Poultry Expert.
Grading Fowls, by A. Little, Poultry Expert.
Heart Trouble, by A. Little, Poultry Expert.
What are You Feeding for? by A. Little, Poultry Expert.
Housing: Three Important Essentials, by A. Little, Poultry Expert.
Menu at the Egg-Laying Test.
Advice to Prospective Poultry Farmers, by A. Little, Poultry Expert.
Seasonal Hints—August, by A. Little, Poultry Expert.
Successful Chick Rearing, by H. G. Wheeldon, Assistant Poultry Expert.
Hints to Breeders, October, by A. Little, Poultry Expert.
Abnormalities in Eggs, by A. Little, Poultry Expert.
Diseases of the Reproductive System, by A. Little, Poultry Expert.
Notes for November, by A. Little, Poultry Expert.
Hints to Breeders. Prepare for the Breeding Season, by A. Little.
Respiratory Diseases, by A. Little, Poultry Expert.
Selection and Preparation of Fowls for Exhibition, by H. G. Wheeldon, Poultry Expert.
The Close of the Hatching Season and After, by H. G. Wheeldon, Poultry Expert.

METEOROLOGICAL.

No. 360. Notes on the Rainfall Season 1919-20 in Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 436. The Possibility of Seasonal Forecasting and Prospects for Rainfall Season 1922-23, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 524. The Use of an Aneroid Barometer, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 532. The Short Period Forecast and Daily Weather Report, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 542. Review of the Abnormal Rainfall Season 1924-25, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 712. The Time, and How to Find it, by N. P. Sellick, M.C., B.Sc. (Eng.).

No. 832. The Weather Map and the Short Period Weather Forecast, issued by the Meteorological Office.

MISCELLANEOUS.

No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C.

No. 479. Quinine Prophylaxis in Malaria, by A. M. Fleming, M.B., C.M., F.R.C.S.E., D.P.H.

No. 518. Locusts as Food for Stock, by Rupert W. Jack, F.E.S.

No. 554. Pisé-de-Terre, by P. B. Aird.

No. 574. Brick-making on the Farm, by A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.

No. 588. Concrete on the Farm, by N. P. Sellick, M.C., B.Sc. (Eng.), Assistant Irrigation Engineer.

No. 677. Road Motor Services.

No. 680. Preparation of Cotton for Sale, by H. C. Jefferys.

No. 686. The Land Bank, Its Functions and How it Operates, by S. Thornton.

No. 687. The Use of Explosives on the Farm, by P. H. Haviland, B.Sc. (Eng.).

No. 702. Book-Keeping on the Farm, by T. J. Needham, Acting Accountant, Agricultural and Veterinary Departments.

No. 707. Wood-Charcoal in Southern Rhodesia, by T. L. Wilkinson, B.Sc., Assistant Forest Officer.

No. 733. Jam-making, by Miss D. Bosman, Home Economics Officer, Division of Agricultural Education and Extension, in "Farming in South Africa."

No. 849. The Preservation of Farm Beacons, by L. M. McBean, Acting Surveyor General.

No. 852. Mixing of Fertilisers: A Guide to Methods of Calculation, by the Division of Chemistry.

How to Make Use of the Fencing Law.

Twelve Simple Rules for the Avoidance of Malaria and Blackwater.

Summary of the Game Laws of Southern Rhodesia

FARMERS' WANTS.

Advertisements under this heading will be accepted from *bona fide* farmers wishing to effect sale, purchase or exchange of produce, live stock or farm implements, at a minimum charge of 2/6 per insertion of 20 words. Extra words will be charged for at the rate of 1/- for every 10 words. The charges for these advertisements must be prepaid, and advertisements will appear on this page each month.

FOR SALE.

Dairy and beef bulls from famous sires and dams of the Maldon Shorthorn Herd.—Apply Roberts & Letts, Bulawayo.